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—OF—
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THE AMERICAN JOURNAL OF

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VOL. III. JANUARY, 1886. No. 1.

CLINICAL MEMORANDA.

S. C. AYRES, M. D., CINCINNATI.

INCRUSTATION OF LIME ON THE CORNEA.

A boy three years of age met with an accident by which the lower half of the cornea became thickly covered with a coat of lime. I first saw him about six weeks after the accident. There was then great photophobia and lachrymation, and the child suffered especially in the earlier part of the day. For a short time I endeavored with atropine and warm fomentations to reduce the inflammation, but the mechanical irritation produced by the crust resisted all palliative measures. It soon became evident that nothing but the removal of the deposit would give relief. The upper half of the cornea was perfectly clear, but the lower half presented a uniform rough white coat. The operation was performed in the following manner: After complete anæsthesia was produced, I passed a Graefe's cataract knife under the upper edge of the deposit (taking great care that its point should not penetrate too deep) and pushed it as far along as I could, and then cut out. This left a flap of the incrustation as broad as the knife blade. With a pair of fine forceps I seized the edge of the flap, and holding it tense sliced off as much as I could safely. I then pierced the crust again and cut out, and again removed a small piece. In this manner I went over the entire area of the deposit to the conjunctival edge removing the crust and leaving the cornea clear. Castor oil and atropine were now used three or four times a day. It was not long before there was a marked improvement in the photophobia, and in three or four weeks it disappeared entirely. The epithelium was reproduced, and the lower half of the cornea again presented a transparent appearance.

MORGAGNIAN CATARACT — SUCCESSFUL EXTRACTION BY A LIEBREICH'S INCISION.

Mrs. T. A. R., 39, a small, delicate. pale-faced woman has been blind for ten years. In the right eye there is a characteristic Morgagnian cataract. The nucleus is unusually small and moves about freely in the capsule. The pupil responds promptly to light and projection and perception are excellent.

The left eye was operated on fourteen years ago, but by what method is not known. The operation was followed by suppuration and shrinking of the globe.

I wanted if possible to do the operation without an iridectomy and decided to make a Liebreich's incision. I made the incision purposely rather short, for it was quite evident that the nucleus was small. As soon as the capsule was ruptured its fluid contents escaped, and the nucleus was seen under the cornea with its upper edge just below the incision. The upper flap of the cornea was then depressed sufficiently to make the wound gap slightly when slight pressure on the lower flap caused the nucleus to slide out, leaving a perfectly clean black circular pupil. Cold water dressings were applied for twenty-four hours and then a dry bandage. Not the slightest reaction followed. In ten days her vision was $\frac{1}{3}$ and she could read Sn No. 2.

VALUE OF AN IRIDECTOMY IN LEUCOMA ADHAERENS.

Mrs. R., 32, had granular conjunctivitis in a very violent form, and during its progress there was ulceration and perforation of both corneæ upward. After the inflammation had subsided, she had fair vision with the left eye—could see to work and read, and it was deemed advisable to let the eye alone. With her right eye she had but little vision, and for fear it should become glaucomatous Dr. Williams decided to make an iridectomy

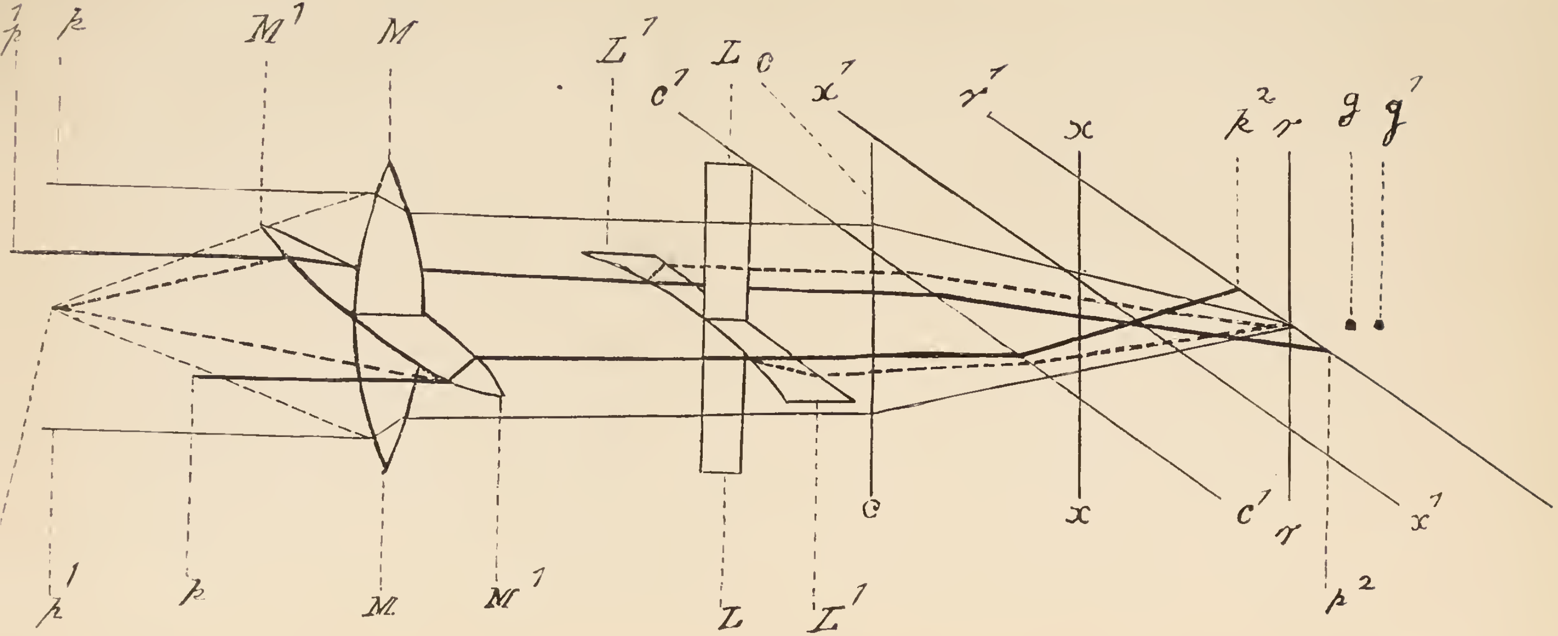

Fig. 4.

downward. There was at the time, 1865, no increased tension, but he feared that it might develop in the future.

At the present date, 1881, (sixteen years since the above statement of her condition) there is a very interesting and instructive state of affairs. The left eye, which then was the best, and, as she supposed, her only eye, is now hopelessly blind from secondary glaucoma. It came on slowly a few years ago unattended by pain, her only warning being her gradually failing sight.

Her right eye, which had been operated on, improved in vision, and she was forced to depend on it as the other one failed. The iridectomy had accomplished all that was expected and even more. It had prevented the development of glaucoma, and had saved her a useful amount of vision. The tension of the eye was normal and media clear, and there is every reason to think that she may retain all she now has.

LEUCOMA ADHAERENS.—SECONDARY GLAUCOMA—IRIDECTOMY—TEMPORARY RELIEF FOLLOWED BY GLAUCOMA, WHICH WAS RELIEVED BY A SECOND IRIDECTOMY.

J. L., 19, had an attack of acute granular conjunctivitis of a severe type, which was quickly followed by ulceration and perforation of the left cornea. The perforation occurred almost directly upward and was followed by a prolapse of the iris. When first seen, the eye presented the following appearance: The lids were granulated but not much thickened. From the upper part of the cornea protruded a *myocephalon* of about three mm. in diameter. It protruded considerably from the surface of the cornea. The iris was drawn up into the perforation and the pupil presented a pear-shaped appearance. The tension of the ball was slightly increased. The eye was sensitive to pressure, and eversion of the upper lid painful. The prolapse was snipped off close to the cornea and a pressure bandage applied. The iris could not be drawn out, as it was firmly agglutinated to the edge of the perforation. A firm cicatrix now formed, and for a while the eye did well and the treatment of the lids was continued. In about four weeks the tension of the eye was considerably above normal, and he suffered pain almost constantly. As eserine gave only temporary relief, it was determined to make an iridectomy. It was accordingly done on the nasal side of the perforation. This relieved the glaucomatous tendency entirely, and he soon went home, both eyes being in a fair condition. In four months he returned stating that the left eye had again become hard and painful. The tension was + 2. There seemed to be only one thing to do, and that, to make another iridectomy. It was done on the temporal side of the scar thus freeing the imprisoned iris completely. It is now more than two years since the last operation, and there has been no return of glaucoma. He enjoys moderately good vision with the eye as the cornea was fortunately not opaque.

TRUE DIPHTHERITIC CONJUNCTIVITIS.

A child five months old was brought for advice as to the left eye which the mother said had been sore for eight days. It had been poulticed but no other treatment had been ordered. The lids were immensely swollen, and presented a peculiar lippy appearance, and their edges were bathed in thick pus. They were very hard and unyielding, and I could not press the palpebral fissure open. After the pus had been carefully removed, that peculiar pale yellowish gray color of the edge of the conjunctiva, so characteristic of this fatal disease, could be seen. This is due to fibrinous infiltration of the conjunctiva causing a compression of the blood vessels and interference with the circulation, and is quite in contrast with the vividly injected and florid appearance we see in croupous conjunctivitis or in ordinary purulent inflammation. The poultices were discontinued, and the mother was directed to wash the eye off frequently with tepid water and to dust iodoform on the edges of the lids. An unfavorable prognosis was given. In three days the lids had so far softened as to enable me to open them sufficiently to show that the cornea was completely destroyed. The fellow eye was not affected.

PYRAMIDAL CATARACT, FOLLOWED BY COMPLETE CATARACT.—SUCCESSFUL EXTRACTION OF ONE OF THE LENSES.

Mamie Conover, 14 (July, '84), has shrunken opaque lenses in both eyes. She still sees to go around, but is at present an inmate of the Blind Asylum at Columbus. The lenses appear very white and chalky. In the center of each lens is a cone or pyramid which is congenital, and from the base of the cones to the periphery of the lenses the capsule presents a wrinkled or corrugated appearance. When three years old an iridectomy inward was made in each eye to improve her vision, the periphery of the lenses being then perfectly transparent. This gave her good sight until three or four years ago when the cataracts began to develop. It was decided to extract the right lens, and under anaesthesia I made the ordinary Graefe's incision upward. I discised the capsule, but could not sweep the cystotome very far around on account of the projecting cone. As the capsule was thickened and opaque, I wanted to remove it with the cone so as to give her a clear pupil. She was very restless under the anæsthetic, and I felt afraid to remove the cone with forceps in advance of the removal of the lens, as the latter was rather small and shrunken, and might be easily dislocated. Slight pressure from below brought the lens out entire, but left the pyramid *in situ* attached by the lower portion of the capsule. The pupil around the pyramid, where the capsule had been discised, was perfectly clear and black. Cold water was applied for a day and then a dry bandage. There was no reaction whatever, and in ten days she was discharged. Her vision was considerably improved, but not enough to enable her to read large print. As this was the most imperfect of the two eyes, she may have a better result after the extraction of the left lens.

I append a report of the case as it was originally reported in the *Lancet and Observer*, Dec., 1874:

CASE OF PYRAMIDAL CATARACT, NOT FOLLOWING OPHTHALMIA NEONATORUM—DOUBLE IRIDECTOMY INWARD—EXCELLENT VISUAL RESULTS.

Pyramidal cataract is generally described as one form of anterior capsular cataract. While it may be congenital, it is usually supposed to result from ulceration and perforation of the cornea, which takes place during the progress of ophthalmia neonatorum. After the perforation occurs, the lens naturally comes forward in close proximity to the cornea. Plastic lymph is thrown out from the walls of the ulcer, and a little nodule of this adheres to the center of the capsule of the lens, partly be cause the rest of the lens is protected by the iris, and partly because the ulcer is generally central and not peripheral. When the ulcer fills up sufficiently to retain the aqueous, and the anterior chamber becomes re-established, there remains on the cornea an opacity more or less extensive, depending on the size of the ulcer. In many cases this opacity disappears, not leaving a trace behind, while in others it remains permanently.

The changes which take place in the lens and its capsule are various. There may remain only a single opaque spot on the capsule, or there may be two or more white dots on it, while the balance of the lens remains perfectly clear. In rare cases we see a well-defined cone or pyramid projecting from the anterior surface of the lens into the aqueous. Occasionally, we observe that the deeper laminæ of the lens, around the central opacity, are opaque, while the margins of the lens are transparent.

This theory of the deposit of lymph upon the capsule has found an opponent in the person of that very close observer, Mr. Hutchinson, of the Royal London Ophthalmic Hospital. He advances the theory "that the mere proximity of inflammatory action on the surface of the conjunctiva and cornea suffices to disturb the nutrition of the lens capsule, and to produce deposits." This theory, to say the least, appears reasonable, and may account for many of the cases where no trace of opacity of the cornea remains. The fact that the convexity of the lens is, in the majority of cases, not at all perceptibly altered, would rather argue against the deposit of lymph on it.

One great difficulty is coming to any definite conclusion, in many of these cases, is that the early history is entirely wanting. There is no positive evidence of purulent ophthalmia in infancy, and yet we find pyramidal cataract present, and it is impossible to say whether there has or has not been ulceration and perforation of the cornea. It will only be by carefully observing the results in cases of purulent conjunctivitis that we will be able to decide the question satisfactorily.

M. C., æt. 3, a healthy, well-developed child, has pyramidal cataract in both eyes. She has never learned to walk, simply because she can not trust herself alone, and not because her limbs are not well-developed. She is the eighth child in the family, and all the preceding ones are healthy and have sound eyes. From Dr. E. Jennings, Dayton, O. (who referred the case to us for treatment), we have learned that the child never had purulent conjunctivitis, or any inflammation of the eyes sufficient to attract his or the mother's attention. As he has had an opportunity to see the child occasionally from her birth up to the present time, we may consider the question of purulent ophthalmia settled, for it would not be likely to escape his careful observation. The defect in the child's eyes was not noticed until several weeks after she was born.

The eyeballs are full and well-developed, the corneæ perfectly clear, and the irides very active. The cones or pyramids which project from the central portion of the lenses seem to come forward almost to the posterior surface of the cornea. The bases of the cones fill the pupil as it appears at ordinary dilation. Around the base of each cone is a narrow ring of opacity in the lens, but beyond this it is perfectly transparent. The child sees best by holding objects to one side or the other; but her sight is very imperfect.

The question of treatment in the case was one of great importance. The safest and best plan was to be chosen, and this was decided to be an iridectomy inward. It was presumable that the fundus was sound from the fact that the child had only a very moderate degree of nystagmus. Discission was contra-indicated, because so much of the lens was transparent. Violent inflammation would most likely have followed such an operation, and the eye have been lost in consequence.

An iridectomy was indicated, first, because it was safest; and second, because if the lens should ultimately become opaque, it would not interfere with a subsequent discission or extraction.

Dr. Williams accordingly operated on both eyes, making an iridectomy inwards, as it was most likely to afford the best visual results in that direction. Very little irritation followed the operation, and in a short time the patient returned home.

In a letter received from Dr. Jennings about fourteen months afterward, he says: "I to-day availed myself of the first opportunity (since the receipt of your letter of inquiry) to visit your patient, Mamie Conover. I found her in great glee, running about the room, picking up small bits of white cloth from the floor, and depositing them in a hole in a chair where a round had been removed. In examining any article closely, she brings the object quite near the eyes. My impression is that she sees best with the left eye, and is constantly improving."

One object in presenting this case was to show the excellent results following iridectomy. It is attended with little or no danger to the eye, and if the lens remains transparent, as it may, gives better visual results than could be expected from the operation of discission. The child is still quite young, and as she grows older will be able to control her eyes better.

The remarkable improvement in her vision was evinced by the fact that she soon learned to walk after the operation.

In this case there was satisfactory evidence that the child never had purulent ophthalmia nor any other inflammation of the eyes sufficiently severe to attract the attention of the mother. We are compelled, then, to abandon the theory of lymph deposit, and also that of the disturbance of the nutrition of the lens capsule from proximity of inflammatory action.

Are we not, then, forced to fall back upon the supposition that the development of these pyramidal cataracts was congenital?

A THEORY OF THE MECHANISM OF ACCOMMODATION.

First written in July, 1885, in Pittsburgh, Pa.,

BY E. E. FURNEY, M. D.

The power of accommodation of the eye to different distances has caused much study and speculation, not alone for the pleasure of merely knowing by what process it is accomplished, but because so many diseases of the eye are so intimately connected with and first made manifest by a failure in it, that an exact knowledge of its methods will help to a more clear understanding of those diseases and the means for successfully treating them.

As none of the theories heretofore suggested have been found to accord with all the known facts, the true one remains to be discovered.

The facts arranged in the order of their bearing upon the subject, exhibit:

First, that all movements necessary for the purposes of accommodation are voluntary.

This fact is axiomatic, but is shown by the experiments of Helmholtz.

Second, that the crystalline lens is the independent variable refracting body subject to change for the purposes of accommodation.

This fact is conclusively proved and shown by the experiments of Cramer and Donders. A corollary to this is that the cornea, sclerotic and muscles of the orbit are unchanged and inactive during the interval of accommodation. The entire mechanism must therefore lie inside the outer tunic of the eye, and must act either directly or indirectly upon the lens.

Third, that the anterior segment of the lens is the only one subject to variation in its curvature for the purposes of accommodation. This is also shown by the experiments of Cramer and Donders. The anatomy of the eye also shows the necessity of this condition. The posterior segment of the lens being supported in a matrix formed by the anterior portion of the vitreous body, while the anterior segment may be said to float in the aqueous humor, which can readily accommodate itself to a change in the shape of the lens.

These are known facts, as they have been abundantly proved. But by what process the lens is made to change the curvature of its anterior surface, has not hitherto been made clear.

Examining it as a purely mechanical problem, there appear but two ways possible, and it is one of these that has long been received as the correct one; but since it can be shown that it calls for movements that are known not to occur, it must manifestly be an error.

The method here referred to is the one in which the capsule of the lens is supposed to be varied in size, forcing the contents into a more or less spherical shape as its area is reduced by allowing it to contract upon itself, or its area is increased or extended by stretching.

This stretching and releasing is represented as being caused by the ciliary muscle which, having its origin in the sclerotic at the border of the cornea, radiates inward and backward and is inserted into the choroid and so indirectly acts upon the suspensory ligament.

That this arrangement might be made to modify the curvature of the lens there can be no doubt. For the muscle by contracting would draw the membrane and suspensory ligament forward, and this would allow the elastic capsule to contract about the lens; and the muscle being relaxed, the membrane by virtue of its elasticity would contract to its first dimensions, and draw upon the borders of the capsule, so as to modify the shape of the lens as before stated. But in doing so it would of necessity do more. The curvature of the cornea would also be affected, for by the contraction of the ciliary muscle the strain would be reduced upon the borders of the capsule of the lens it is true, but the strain upon the borders of the cornea would be increased by an equal amount, thus flattening the cornea, and by a relaxation of the ciliary muscle, opposite results would follow. But we know that the curvature of the cornea remains unchanged.

The pressure transmitted through lens and vitreous body onto the retina would vary with each change in the tension of the muscle and cause sensations that are known not to be present. Again, since the posterior segment of the lens is more convex than the anterior, a tension upon the borders of the capsule would tend to flatten that surface and to make the anterior surface more convex instead of less.

These things would seem to afford sufficient reason for the rejection of this theory, though additional reason seems to be afforded in the apparent ability of the other theory to meet these facts, though it may call for further investigation in microscopic anatomy before it can be fully accepted.

In this other theory the area of the capsule of the lens is assumed as the practical constant, and the contents or volume of the lens to be the important variable, and made so by the injection into or withdrawal from the intercellular spaces of a small quantity of a transparent liquid. The ciliary processes may serve as reservoirs of this liquid, or possess the power of quickly secreting it.

The contraction of their muscular coats or of the muscular coats of their arterial components, pressing the liquid out of these reservoirs into the lens, increasing its volume and thereby the convexity of its anterior segment, and projecting it forward into the space made vacant by the reduction in volume of the ciliary processes or cysts of an exactly equal amount. The greater flatness of the anterior surface causes that surface to present the lesser resistance and therefore to be the one pushed forward and rendered more convex.

In this way there is no strain transmitted to retina. sclerotic or cornea : every force is exactly balanced, and a most perfect mutual compensation is afforded for the change in volumes.

By a relaxation of the muscles the liquid would retreat from the lens into the reservoirs, again filling the space made vacant by the flattening of the lens.

Nourishment also would thus be afforded the lens at each accommodation for a near object from a far one. And by allowing too long an interval to elapse between such movements there may be a cause for disease. for which the remedy would be at

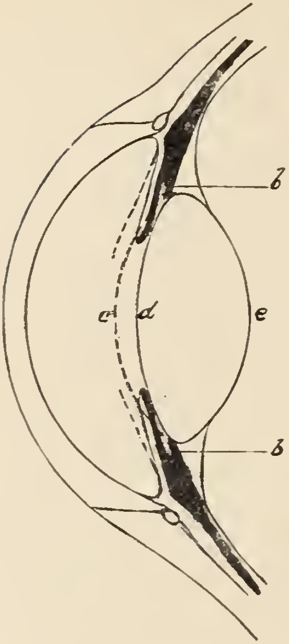

Fig. 1.

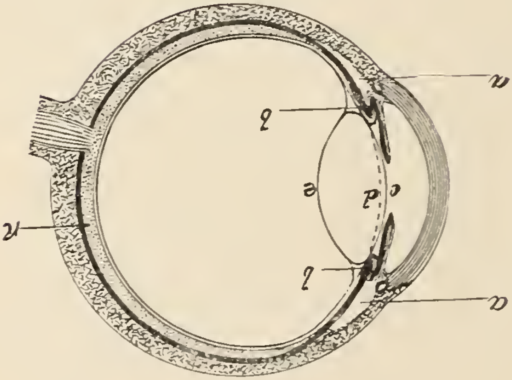

Fig. 2

once apparent, that of supplying more nourishment by the pulsations of frequent accommodation and by a careful avoidance of a fixed focus resulting from a too constant attention to any one object, either near or remote.

To make the theory clear, I present sketches with explanatory notes referring to them by letters.

In Fig. 2. the ciliary bodies are shown at a. a.: the muscle having origin its at the border of the cornea, and since action and reaction are equal, a strain on the cornea would equal that on the choroid, and would tend to flatten the cornea.

In Fig. 2. it will also be seen that the retina R. lies in front of the choroid and therefore if the choroid should be drawn forward by the ciliary muscle at the same time the cornea is drawn backward by the reacting force, it would be compressed between these two opposing forces.

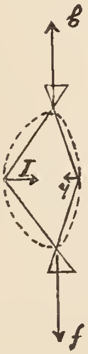

Fig. 3.

In Fig. 3 the arrows f and g show the directions of strains supposed to be exerted on the border of the capsule. Taking these as equal, in opposite directions and all in the same plane, we find by the parallelograms of forces the arrows h and i, which by their length show the ratio of forces acting in a way to flatten respectively the anterior and posterior segments of the lens. The force i, acting on the posterior segment, being several times greater than h, which acts upon the anterior segment.

In Figs. 1. and 2. b b. represent the ciliary processes or cysts (?) which by contracting on themselves inject the fluid into the lens and advance the anterior surface from d to e.

ON THE USE OF CYLINDRICAL GLASSES IN COMPOUND ASTIGMATISM.

BY H. CULBERTSON, M. D.,
Assistant Surgeon United States Army, Retired.

The use of *positive*, in lieu of NEGATIVE, cylinders, in COMPOUND ASTIGMATISM, in proximal vision has been of practical value to me in the correction of such forms of ametropia. If, however, perfect remote vision is demanded in CO. M. ASTG, the *negative* cylinders do better. Most of such patients are better satisfied to sacrifice somewhat their *distant* vision by using *positive* cylinders, for the advantage derived from these in *proximal* vision. Such glasses are often not strong, negative D 0.25, or—D 0.5, frequently doubling distant vision. That we have a choice of cylindrics, in the correction of ametropia, is well known. Thus, in a given case of CO. H. A. = + D 1.0 Sp. ○ + D 0.5, axis 180°, we may employ + D 1.5 Sp. ○ — D 0.5 cy. axis 180°; or, + D 1.5 Sp. ○ + D 0.5 cy. ax 90°. I have used *these* forms and not unfrequently prefer the second to the first in near, and the former, in remote vision. Again, in a case of CO. M. A. = — D 3. 5 Sp. ○ — D 0.5 cy axis 90°, the correction may be = — D 4.0 Sp. ○ + D 0.5 cy. axis 90°; or — D 4.0 Sp. ○ — D 0.5 cy. axis 180°. The *former* combination gives better results in *proximal*, the latter in *remote* vision: and while *slightly* impairing the *remote*, the *proximal* vision is improved with the first formula.

To illustrate this subject Fig. 4, is necessary. In this:

Let p = Parallel rays in horizontal plane.
" p^1 = " " vertical plane.
" p^2 = " " rendered myopic in horizontal plane.
" M = Vertical section of + spheric.
" M^1 = Horizontal section of + spheric.
" L = Vertical " " — cylindric.
" L^1 = Horizontal " " — "
" c = Vertical " " cornea.

Let c^1 = Horizontal section of cornea.
" x = Myopic focus in vertical plane.
" x^1 = " " " horizontal plane.
" r = Vertical section retina.
" r_1 = Horizontal " "
" g = Hypermetropic focus in vertical plane.
" g^1 = " " " horizontal "
" A = Accommodation in vertical "
" A^1 = " " horizontal "
" d = Position of object in near vision.

These several equivalents *without* exponents, refer to the *vertical*, those *with*, to the *horizontal* plane.

A case of CO. H. ASTG. is assumed, = + D 3.0 Sp. $\overset{\frown}{\smile}$ + D. 1.0 cy. axis 180°. In this example there is H. = + D 4.0 in the vertical plane, and H = +D 3.0, in all the other meridians of the eye.

In this case also, *without correction*, p^1, tends to focus at g^1, and p at g. If M^1= + D 4.0 be applied, p^1, will be refracted in the heavy lines and reach p^2, and artificial myopia be induced in the *horizontal* plane = — D 1.0; because there are but = D 3.0 H, in said plane, and the + D 4.0 refracts = + D 4.0. Applying now M = + D 4.0, p will be refracted and reach the retina r, in focus, for the H. in this plane (the vertical) is = + D 4.0. If now L^1 = — D 1.0, be applied p^1, will be refracted, as represented in the heavy dotted lines, by L^1, and p^2 will become r^1. As *this* section of the *cylinder* L does not refract, the rays in the *horizontal* and *vertical* planes will now be upon the retina r r^1, and VISION REMOTUM will be distinct.

As all the foci of the meridians of the eye are now upon the retina r r^1 in *remote* vision, if the object be approached to the eye, as represented at d, the accommodation A A^1 will be uniform in the *several* planes, the foci will be maintained at r r^1, and VISION PROXIMUM distinct in all the meridians of the eye.

If, in *proximal vision*, + D 4.0 Sp. $\overset{\frown}{\smile}$ + D 1.0 cy. axis 180° be applied, and the *negative cylinder* removed, p^1 will, from the refraction of M^1 = + D 4.0, become p^2, (for there is only = + D 3.0 of H in this plane, which M^1 overcorrects to + D 1.0) and *artificial myopia* is induced in this plane = — D 1.0. This

+ cylinder does *not* refract in the *horizontal* plane. Now applying M and L = + D 4.0 Sp. $\supset$ + D 1.0 cy. axis 180°, r will become p^2, or the H = + D 4.0 of the *vertical* plane will be corrected by M; and L now = + D 1.0 cy. will induce an *artificial myopia* = — D 1.0 in the VERTICAL plane, and *all the meridians* will be myopic. If now d be approximated to the eye, the foci will be maintained upon the retina r r^1 by A A^1, *uniformly*, and the image will be *larger* and *proximal* vision more distinct as the object is held somewhat nearer the eye.

As is well known, this case could have been corrected by applying + D 3.0 Sp. $\supset$ + D 1.0 cy. axis 180°. But the foregoing plan has its advantages in distant, and in some cases for proximal, vision. A case is given, selected from a number appropriate, which could be cited.

Miss M. McC., æt. 31 years, a school teacher, has V. R. and L. = D $\frac{6.0}{6.0}$, and D $\frac{0.6}{0.25}$ Snellen. Without duboisine, and with + D 0. 5 Sp. $\supset$ — D 0.25 cy. axis 170°, V. R. = D $\frac{6.0}{6.0}$ S.; and with + D 0.75 Sp. $\supset$ — D 0.5 cy., ax. 20°, V. L. = D $\frac{6.0}{6.0}$ Snellen. . Under duboisine, with + D 1.0 Sp. $\supset$ — D 0.5 cy. ax. 170°, V. R. = D $\frac{6.0}{6.0}$ S.; and with + D 1.25 Sp. $\supset$ — D 0.5 cy., ax. 20°, V. L. = D$\frac{6.0}{5.0}$; and V^2 = D $\frac{6.0}{5.0}$, and D $\frac{0.6}{0.25}$ Snellen. She preferred the *negative* cylinders as *these* rendered better *remote*, and still gave fair *near* vision in her duties as a teacher.

In cases of COMPOUND MYOPIC ASTIGMATISM, the principle of using cylinders, as above stated, has also been useful in such examples of ametropia. This subject may be illustrated by Fig 5, in which,

Let p = Parallel rays in vertical plane.
" p^1 = " " " horizontal "
" p^2 = Focus H " " vertical "
" M = Vertical section negative spheric.
" M^1 = Horizontal " " "
" L = Vertical " positive cylindric.
" L^1 = Horizontal " " "
" c = Vertical " cornea.
" c^1 = Horizontal " "
" x = Vertical myopic focus.

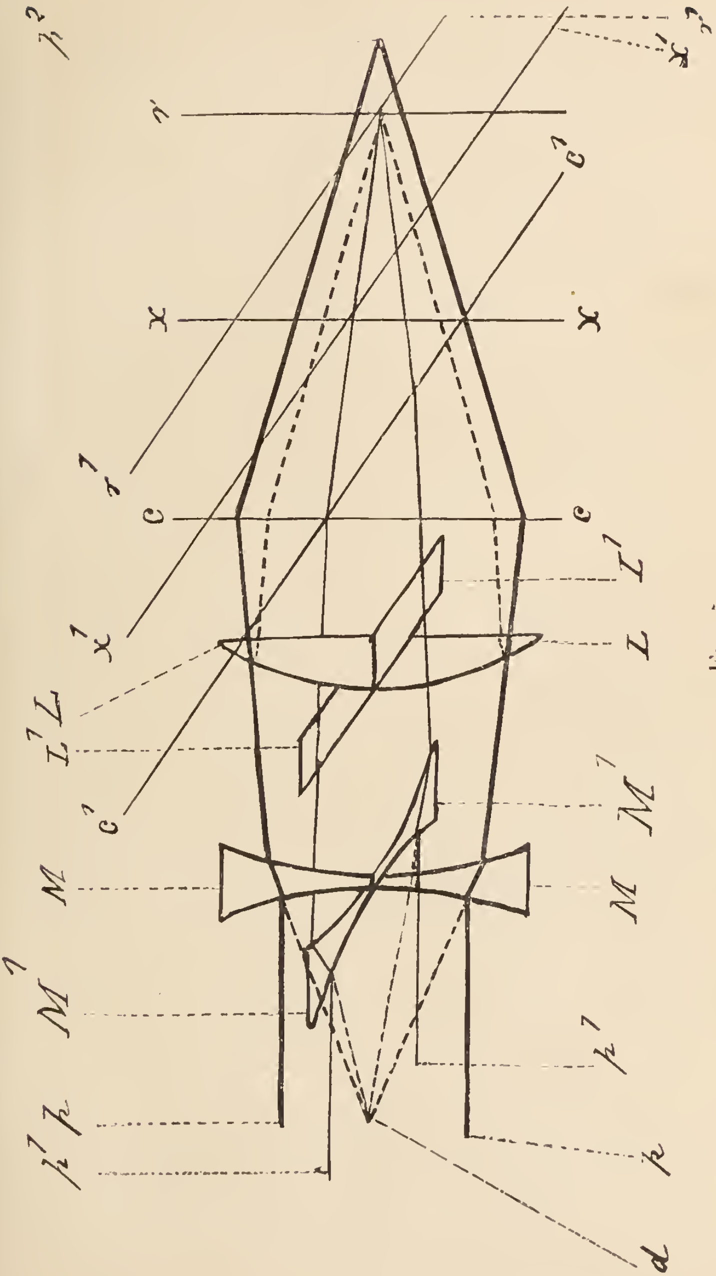

FIG. 5.

Let x^1 = Horizontal myopic focus.
“ r = Vertical section retina.
“ r^1 = Horizontal “ “
“ d = Position of object in near vision.
“ A = Accommodation in vertical plane.
“ A^1 = “ “ horizontal “

These references *without* exponents (excepting p^2) refer to the *vertical*, and those *with* exponents, to the *horizontal* meridians.

Suppose a case of this form of ametropia = — D 2.0 Sp. ⌒ — D 1.0 cy. axis 180°; in which there is a myopia — D 2.0 in *all* the meridians, and = — D 3.0 in the *horizontal* plane. In such a case, without the correction of glasses, parallel rays p p^1 will be refracted excessively and reach r r^1 in circles of diffusion. But when M = — D 3.0 Sp. is applied in the *vertical* plane, the heavy parallel rays, p, will tend to focus at p^2, from the fact that there are *but* = — D 2.0 OF MYOPIA in this plane, and M is = — D 3.0 Sp., and hence results, in this plane, ARTIFICIAL H = + D 1.0. If now M^1 = — D 3.0 Sp. be applied in the *horizontal* plane of the eye, and in which plane there is myopia = — D 3.0 M^1 will correct *this meridian*, and p^1 will become r^1, and the focus of this plane be upon the retina. If now the *positive* cylinder be applied = + D 1.0 cy. axis 180° (and refracting only in the vertical plane)L will correct the *artificial* H=+D 1.0 cy in the *vertical plane*, as represented by the heavy dotted lines, and p will be rendered diverging by M, and less by L, and will be brought to a focus at r. As the rays are in focus upon the retina at r r^1 in all the meridians, *remote vision* will be distinct

If now d be approached to the eye, the foci being upon the retina in all the meridians, A A^1 will maintain them upon this membrane uniformly, and PROXIMAL VISION will be distinct.

If now it is desired to apply — D 3.0 Sp. ⌒ — 1.0 cy. axis 90°, then the *new* L will be *non-refracting* in the *vertical* plane; but the new L^1 will refract = — D 1.0 in the *horizontal* plane. It follows that M^1 = — D 3.0 Sp., being applied and acting on the *horizontal* plane, and *also* L^1 = — D 1.0; and as there is but = — D 3.0 of myopia in the eye, in *said plane*, that there will be induced in it *artificial* H = + D 1.0. At the same time, in the *vertical* plane of the eye, as there is but = — D 2.0 of myopia, and as M refracts = — D 3.0 Sp. in *said meridian*, there will result in it *artificial* H = + D 1.0; and now the *horizontal* and *vertical* meridians are hyperopic = + D 1.0 and *remote vision* will require accommodation. As the meridians are over-corrected uniformly, and the foci upon the retina r r^1, if the object be approached to d, A A^1 will act *uniformly* upon the rays in all the meridians, and the foci be maintained upon the retina. It is evident that from this combination A A^1 will be increased = + D 1.0 in *proximal* vision and to the same degree in *remote* vision. Such formulæ might be useful in compelling the patient to remove the near point in *proximal* vision, thus diminishing the diverging of the incident rays, and so be useful; but I have not used this *negative formula*, and am unable to speak practically upon this point as to the effect in *proximal vision.*

As is well known, this form of ametropia could be corrected with — D 2.0 Sp. ⊂ — D 1.0 cy., axis 90°.

A case is given from a number which might be reported:

Mr. H. L., æt. 39 years, an architect, has R. E. V = D $\frac{5.0}{6.0}$ and D $\frac{0.5}{0.15}$ S.; L. E. V. = $\frac{5.0}{15.0}$ and D $\frac{0.8}{0.15}$ Snellen. With — D 1.5 Sp. ⊂ + D 0.75 cy, axis 180°, V. R. = D $\frac{4.0}{5.0}$, and with — D 1.5 Sp. ⊂ + D 0.75 cy., axis 180°, V. L. = $\frac{4.0}{5.0}$; and V^2 = D $\frac{5.0}{4.0}$ and D $\frac{0.6}{0.28}$ Snellen. These glasses are still satisfactory after eighteen months' use. In this case an effort was made to employ — D 0.75 Sp. ⊂ — D 0.75 cy, axis 90°, R. E. and — D 1.0 Sp. ⊂ — D 0.5 cy., axis 90°, L. E.; and with these *remote* vision = D $\frac{5.0}{5.0}$ Snellen, obtained, and objects were seen more distinctly in the *distance*; but in *proximal vision*, sight = D $\frac{0.6}{0.40}$ Snellen resulted, and was not so distinct as with the + cylinders.

A CASE OF ACUTE GLAUCOMA OF ONE EYE CURED TEMPORARILY BY ESERINE; RELAPSE; IRIDECTOMY.

BY DAVID WEBSTER, M. D., NEW YORK.

March 12, 1878, Mrs. Mary S., aged 43, a domestic, presented herself at the eye clinic at the college of Physicians and Surgeons on account of pain in and about her right eye, with great blurring of sight. which, she said. had been getting worse and worse for several weeks.

Upon testing her vision we found R. V. = $\frac{8}{CC}$; no improvement with glasses. L. V. = $\frac{20}{XX}$; Hm. $\frac{1}{60}$.

The left eye was normal in every respect, and remained so while under observation.

The right eye showed much ciliary injection, increased tension and mydriasis, no mydriatic having been used. There was so much cloudiness of the media as to prevent a good examination of the fundus, but the optic disk could be seen well enough to permit the breaking of the blood vessels in passing over the edge of an excavation occupying the whole papilla to be observed. The patient was directed to drop into the eye a drop or two of a one per cent solution of eserine once a day.

March 26. R. V. = $\frac{20}{C}$. The patient says that she has had no neuralgia in the eye since she commenced using the drops. She was ordered to use a two-grain solution of eserine twice a day.

May 15, 1878. The media are perfectly clear, but the tension is still somewhat increased and the pupil slightly dilated. There is marked cupping of the disk and slight arterial pulsation. Vision = $\frac{20}{XX}$ with $+ \frac{1}{12}$.

June 26. The eye is in precisely the same condition as at her last visit.

Sept. 17. Vision = $\frac{20}{LXX}$ without a glass, but raised to $\frac{20}{C}$ with a

$+\frac{1}{10}$. To use a one per cent solution of eserine three times a day.

Sept. 20. V. = $\frac{20}{L}$ with $+\frac{1}{20}$. Limitation of infero-nasal portion of visual field.

Sept. 27. V. = $\frac{20}{L}$ with $+\frac{1}{18}$. Tension still increased, arterial pulsation, increasing excavation of the papilla, some ciliary injection and very little pain.

The patient now consented to an iridectomy, an operation which had long since been advised, but which she had always postponed on account of circumstances over which she had no control.

Sept. 28. Iridectomy upward, under ether.

Oct. 2. V. = $\frac{20}{L}$ with $+\frac{1}{18}$.

Oct. 26. V. = $\frac{20}{L}$ with $+\frac{1}{24}$.

It will be remarked that the glaucomatous eye accepted convex glasses of very variable strengths at the different testings.

The strongest convex glass with which the patient saw as well as with any other was always the one selected. This variation in the amount of hypermetropia was probably due in part to the influence of increased and varying intraocular pressure upon the indices of refraction of the dioptric media, and in part to the eye, having been more or less under the influence of eserine at most of the examinations.

The eserine was undoubtedly of temporary benefit in this case, but the patient put off the operation of iridectomy too long, so that after the operation the vision never rose above—$\frac{20}{L}$. In all probability if the operation had been performed when we first saw her, there would have been a permanent restoration of sight to $\frac{20}{XX}$.

CORRESPONDENCE.

Little Rock, Ark., Dec. 17, 1885.

Dear Dr. Alt:—Dr. Fox's formula seems to me a very strange one. I cannot well conceive of two axes of like excessive or deficient refraction in the same cornea, crossing each other at any other angle than 90°, when, if they are equal, it becomes a simple spherical error, and if unequal, compound astigmatism. If the lens and cornea in the same eye were each to take on like regular astigmatism, their axes might intersect at any angle and produce such a condition as Dr. Fox and Dr. Little mention; but in Dr. Fox's case there was aphakia.

Dr. Little, in speaking of Mr. Borsch being able to grind a sphere and double cylinder in the same lens, says: "Prior to this time I had been unable to provide cases of mixed astigmatism requiring presbyopic correction with a spectacle combining both corrections." Unless the lens takes on regular astigmatism also with presbyopia I cannot see the cause of this. I have certainly had no trouble in obtaining a formula for a sphero-cylinder to meet increasing presbyopia. I never prescribe cross cylinders. As to Dr. Waldmann's correcting a + 3 D cy. ax. 180° ⌒ + 2 D cy. ax. 50° with a — 1 D s ⌒ — 3 D cy. ax. 15°, I think he is simply mistaken. The correction is only approximate, and it is a mathematical and experimental error.

Very respectfully,

T. E. Murrell.

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AN EPIDEMIC OF TRACHOMA AMONG THE CHILDREN OF AN ORPHAN ASYLUM.

BY ADOLF ALT, M. D.

The paper which was recently presented to the New York Academy of Medicine by Dr. R. Derby on infectious eye diseases in the public institutions of New York, prompts me to report here shortly an epidemic of trachoma in the German Protestant Orphan Asylum of this city, which I had occasion to observe almost from the beginning.

Two years ago in May, the physician of this institution, which by the way is one of the best managed and cleanliest kept of its kind, brought a girl to my office on account of an eye affection, which she claimed to have first noticed when coming across the ocean several months previously. She had trachoma in an advanced stage with pannus and ulceration of the cornea. I advised absolute isolation, and treated the child myself for about ten weeks with cuprum sulphuricum in substance, bathing with cold water and instillations of atropia, and at times an ointment containing yellow oxide of mercury was substituted for the copper. She improved rapidly under this treatment, which was later on applied by the physician of the institution. I was told that two or three other children complained of their eyes and asked to have them brought to me, but this was not done.

On the 4th of October of the same year, I was called to the

Asylum, because a great many of the children now complained of their eyes. I found that of the sixty-three children who were the inmates of that institution, no less than forty-three had trachoma of the lids in all stages, and about twelve more were evidently already infected.

I heard now that isolation had been impossible, as there was no sick room large enough to accommodate the increasing number of infected children, and they had been playing and going to school together all the time. Yet, each had his separate bed, washing apparatus, towels, etc. The institution, since its existence, had been so fortunate as to have but little sickness, and the necessity of building a separate house for their sick children had never been brought home to the otherwise excellent trustees and managers of the asylum. They have had such a house erected now.

During the following months all remaining children, excepting four, were also infected.

Isolation being impossible, this was not to be prevented. I at once advised to keep all children out of school, and not to admit any new ones to the asylum, which advice was complied with. I then treated them, with the assistance of the physician ot the asylum, with sulphate of copper or yellow oxide of mercury (and atropia, etc., when necessary). This treatment has been kept up ever since, and during the whole period pannus made its appearance only in one girl, and slight marginal ulceration of the cornea in only about half a dozen cases. In four cases I operated for strabismus convergens during the time of treatment, and the healing and effect of the operations were not interfered with by the trachoma. None of the adults living in the house were infected. After two months of regular careful treatment a number of the children could be put on a milder astringent treatment, and soon afterwards be discharged. Thus the number of badly affected ones grew steadily less, and during the summer of last year quite a large number of the children could go to school again. Of late there have been only four girls left, who had made but very little progress, and I decided to use jequirity powder on their lids. This was done with a very happy result, and the epidemic may now be considered at an end, although a number of the children are yet being treated with astringents.

The house in which these children live lies about four miles from the center of the city, surrounded by a large yard, with beautiful trees, and in a very healthy locality and atmosphere. There is hardly any doubt but that the affection has been imported into this asylum by the first patient, and from the outside.

The experience which this asylum has gone through shows plainly how carefully children, who are admitted to such an institution, should be examined, and especially with regard to their eyes. On the other hand, there should always be a chance for absolutely isolating, not only the children who suffer from an infectious eye disease, but from any infectious disease.

Besides the cases with strabismus only one, a boy, presented a complication. He had stricture of the nasal ducts; but I never probed them, as the obstructions gradually disappeared with the trachoma. Whether there was any trachoma in the lachrymal sac, or what the obstructions were, I am, of course, unable to state.

The uniformly good results and the freedom from corneal affections (except in a few cases) speak strongly in favor of a careful treatment with cuprum sulphuricum, although the progress was sometimes rather slow.

THE PRESENT STANDING OF TOBACCO AMBLYOPIA.

BY J. L. MINOR, M. D. OF MEMPHIS, TENN.

Mackenzie in his great work on diseases of the eye, described a class of cases, characterized by reduced vision or loss of sight, occurring in persons who used tobacco excessively; and, supposing that tobacco was the cause of the trouble, he classified them under the head of *tobacco amaurosis.* The weight of Mackenzie's authority was sufficient in itself to guide many, and to influence most observers before the ophthalmoscope was introduced. Since its advent however, the term *amaurosis* has had an increasingly restricted application in ophthalmic practice. Yet *tobacco amaurosis* has retained its place in our nomenclature, and is treated of, in many of our text books, as a distinct and characteristic affection. Many cases have been reported, and numerous articles have been written to prove its existence.

When it is considered that tobacco is used by a large proportion of the male population of the world—and frequently to excess—it is to be wondered at that cases of *tobacco amaurosis* are not more frequently met with. And stranger still is it, to see competent ophthalmologists make the diagnosis of *tobacco amaurosis*, in cases with clearly marked symptoms of brain or spinal cord disease, or other affections which may and do cause diminution in or loss of vision the same in kind as is claimed for tobacco. This must necessarily lead to one of two conclusions, either that *tobacco amaurosis* has a much wider application than its most ardent advocates claim, or that there is a lack of proper care in eliminating other causes of reduced vision. To reach a correct understanding of the subject, it will be necessary to study the claims made by the advocates of the *tobacco amaurosis* theory, and the facts upon which these claims are based; and finally if possible to subject these *facts* to the crucial test of experiment. This I shall attempt to do: and without endeavoring to give an exhaustive résumé of the literature. I shall limit myself to such text-books as I have at my command, and to a few of the most frequently quoted articles which have appeared in medical journals.[1]

The text-books which I have consulted show anything but unanimity of opinion. While some of them speak positively of the existence of *tobacco amaurosis*, others refer to the subject with a vagueness of expression that at least suggests a lack of positive conviction, and a few deny its existence entirely. This variety of opinion is due to a difference in interpretation of facts. The works which adopt the theory, accept it with statements more or less positive and without argument: while the doubting ones usually go into detailed reasoning in support of their statements. And in reports of cases there seems to have been too great a readiness to attribute to tobacco symptoms which might be ascribed to other causes—causes which are quickly recognized when tobacco is not used. Of the text-books which stand more or less positively committed to the theory of *tobacco amaurosis* may be mentioned.

(1.) *Mackenzie*, who has already been sufficiently referred to.

(2). *Powers* gives tobacco as a cause of optic nerve atrophy, and quotes the observations of Mr. Wordsworth.

(3). *Bader* treats systematically of *tobacco amaurosis*; and under this heading says that post-mortem examinations have shown traces of basilar meningitis which affected the optic nerves and other nerves of the face.

(4). *Green* gives his own views, which he says may be taken substantially as those of American ophthalmologists. He says that a large proportion of cases of optic nerve atrophy which have been observed have been in cigar-makers and workers in tobacco. They usually use tobacco freely. Inveterate drinkers, who are usually inveterate smokers, are also liable to suffer from amaurotic affections.

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[1] I have attempted to reach the *popular* medical opinion concerning *tobacco amblyopia*, and consequently have relied chiefly upon text-book's on ophthalmology, because it was thought that the drift of professional opinion could be more easily and correctly reached by this method than by any other. Text-books are usually written by representative men, who's opinions have been formed, not alone by close observation of their own, but by careful analyses of current opinions; and thus formed they reach students and practitioners, who accept them as authorities and adopt their views. This must be my excuse for omitting to mention many able articles which have appeared in medical journals.

(5). *Gowers* gives tobacco as a cause of amblyopia, and refers to the writings of Hutchinson, Hirschberg and Foerster.

(6). *Nettleship* says that his own opinion is that tobacco is the essential agent in producing *tobacco amaurosis*, but admits that the share to be attributed to alcohol, general exhaustion, anxiety, underfeeding, dissipation, etc., must not be overlooked, so long as competent observers hold that the disease may be brought on by such influences collectively, without tobacco.

(7). *McNamara* says that he has "no hesitation now, in affirming with Dr. Webster, that the use of tobacco alone, or of tobacco and alcohol combined, may produce impairment of vision, ranging from the slightest blurring to total blindness.

And to these may be added:

(8). *Juler*, who believes in and describes the affection, and

(9). *Swanzy*, who, under the head of central amblyopia, says that the most common cause of this disease is alcohol, or tobacco, or both.

Of the authors who give their *quasi* acquiescence to the theory, may be mentioned :

(10). *Stellwag*, who says "it is said that the abuse of tobacco plays a part in the production of amaurosis, and that the fact is corroborated by the recession of the affection where tobacco is discontinued. It is said to appear independently, but is most frequently associated with alcohol.

(11). *Noyes*, after referring to the difficulties of separating alcoholic from tobacco cases, says they both commonly combine. He, however, describes the two conditions separately, and refers to the writings of Hutchinson and Foerster.

(12). *Williams*, in treating of chronic optic neuritis, cites Hutchinson's observations, and without committing himself to an opinion further than saying that abstinence from tobacco is essential in treatment, closes the subject.

(13). *Mittendorf* says that the abuse of tobacco is not a very frequent cause of amblyopia, and admits that in most cases alcohol is also used; and that American ophthalmologists are of the belief that tobacco takes a less active part in producing amblyopia than alcohol.

(14). *Wolf* refers to the divided opinion as to the production of amblyopia by tobacco and alcohol, and says that there is no doubt that smoking, and drinking of spirituous liquors has a great tendency to produce amblyopia.

(15). *Wecker* mentions tobacco and alcohol as being causes of amblyopia, but says that good authorities deny that tobacco has any causative influence in that direction. He saw many cases during the siege of Paris who were suffering from exhaustion and fatigue.

(16). *Wells*, while he does not subscribe to the belief that tobacco alone will produce amblyopia, describes the affection, and admits that it may enter into the causation of impaired vision. He quotes Mr. Hutchinson and gives his description of *tobacco amaurosis*, as follows :

"The cases which form the subject of this paper are recognized by the loss of vascular supply to the optic nerve itself. There is not usually much diminution in the size of the vessels which supply the retina, and often these remain of good size, when the nerve itself is as white as paper. The first stage (one which is usually very transitory and perhaps often altogether omitted) is one of congestion, during which the disc looks too red. Then follows pallor of the outer half of the nerve—that part which is nearest the yellow spot. During these stages the patient complains merely of dimness of vision. Everything seems in a fog to him, but he has no pain in the eyes, nor any photopsia or photophobia. In a later stage the whole of the optic disc has become pale, even to blue-milk whiteness; and later there is proof, not only of anaemia of the nerve, but of advanced atrophy. The stages generally occupy from four months to a year. In many cases the patient becomes at length absolutely blind; but in others the disease having advanced to a certain point is arrested. There is from first to last no evidence of disease of any structure in the eyeball, excepting the optic nerve. And even after years of absolute blindness, the retina, choroid, etc., remain healthy, and their blood supply is good. Almost always both eyes are affected, and progress almost *pari passu.* Sleeplessness, a little giddiness and a little headache are the only constitutional symptoms which attend it, and these disappear at a later stage, and the patient regains his usual health. As there is no tendency to fatal complications, opportunities for post-mortem examinations of the brain are hardly ever obtained."

This is in the main the accepted description of the affection. Foerster has pointed out the fact that the failure in vision is due to a reduction in visual acuity over a small area in the center of the fundus—a central scotoma, while the visual field remains normal in its peripheral parts. The scotoma is transversely oval, extending usually from the point of fixation, which it involves, to the blind spot corresponding to the optic nerve entrance. It belongs to the negative variety, and is most easily detected with colors that are in the normal state best seen in the center of the field, i. e., red and green, which are not recognized in the scotoma, though the peripheral color perception and field may be entirely normal.[1]

Patients with this form of amblyopia find their way about with much greater ease than would be anticipated from the degree of vision possessed, because the periphery of the the retina retains its normal amount of vision; and for the same reason the pupils are smaller in this than in other forms of amblyopia, for the light, being perceived to the normal extent in the periphery of the retina, excites contraction of the pupils. Vision is better in dull illumination, because under this influence the pupils dilate and allow more light to enter the eye.

Articles which have appeared in medical journals by Hutchinson, Foerster and Wordsworth, are frequently referred to in support of the *tobacco amaurosis* theory, and they will be noticed after we have examined some of the text-books that deny the existence of this form of amblyopia altogether; and, first of these, may be mentioned.

(17). *Carter*, who points out the fact that tobacco, if a cause of optic nerve atrophy, is by no means the only one, for thousands who smoke excessively experience no inconvenience; hence, there is liability to mistake coincidence for cause. Reference is made to observers who have noticed that sufferers from nerve atrophy are frequently great smokers. This statement is to be accepted as indisputable, because it comes from reliable and competent men; but when they say in such instances, much smoking is the cause of the atrophy, they step from the domain of observed facts and enter the debatable ground of opinion. After enumerating the various causes of optic nerve atrophy, he insists that these must be excluded before the diagnosis of *tobacco amblyopia* is made, and this he claims has not been done in cases which have been reported. Mr. Carter was, himself, at one time stationed in Asiatic Turkey, where smoking is carried on extensively, yet he observed no cases of amaurosis. He quotes M. Farquhar, who was for many years surgeon to the British Consulate in Alexandria, as saying that he had examined mȧny thousands of cases of diseased eyes, and that it was a mystery how few cases of amaurosis were seen, for the Egyptians smoke possibly more than the Turks. Mr. Dickson, physician to the British Embassy at Constantinople, wrote, "*Amaurosis*, taking the term in its widest sense, is not a common complaint in Constantinople, or in Turkey generally; and yet smoking tobacco is so prevalent a vice that it is practiced by the whole population, Mohammedans, Christians and Jews with hardly a single exception. The usual amount consumed by one person, per month, may be estimated at two and a half pounds." Mr. Dickson had found amaurosis frequent in Tripoli and in Northern Africa, where tobacco was little used. And Dr. Huebsch, an oculist in Constantinople, wrote that tobacco was used excessively by men, women and children, yet amaurosis was rarely seen; and that he had never been able to attribute amaurosis to the abuse of tobacco.

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[1] See article on Central Color Scotoma, by J. L. Minor in *Am. Jour. of Med. Sci.*, for April, 1882.

(18). *Allbutt*, after referring to the difficulty of isolating the antecedents of amaurosis, and of distinguishing which are the essential and efficient causes, says that much trouble is often experienced in saying which of the true causes is the actual cause. When it is desired to isolate tobacco, accident can only be eliminated by including a large number of, not amaurotics, but smokers, and comparing them with a like number of abstainers. He then gives his reasons for disbelieving in *tobacco amblyopia* as follows: First. "Amaurosis is very common, and is common in certain districts especially, but in districts which do not coincide with districts of principal manufacture or consumption of tobacco. Secondly. Many causes are at work, in this present busy age especially, which may have far more to do with amaurosis. I may refer to alcohol as one of these: as another to the incessant overuse of the eyes in a large number of competitive trades, in which men especially are engaged. And again, to those many strains upon the mind and nerves, which overtask the nervous centers, and carry the optic nerve with them. Thirdly. In many cases of so called recovery from amaurosis on the omission of smoking, we have no certain evidence that the condition was not one of general anaemia—made especially manifest in that form of anaemia accompanying menorrhagia, lactation. * * * Fourthly. We have no satisfactory evidence that cases quoted have been observed for any length of time. Degenerative nervous diseases, as locomotor ataxia, general paresis and disseminated sclerosis are much more common in men than in women, and of such diseases, atrophy may be the first sign." He further states that in ophthalmic clinics, time is not afforded, nor is it the habit to make searching inquiry as to the presence or absence of obscure nerve disease; and that this poverty of time, and inadequacy in history taking, is manifestly shown in most cases which are reported. Moreover, the symptoms and appearances which are given as peculiar to *tobacco amaurosis*, are the exact counterparts of cases which have been watched and observed throughout in many forms of cerebro-spinal disease.

(19). *Walton* concludes after much study, that there is no special effect exerted by tobacco upon the optic nerves.

(20). *Ely* examined over one hundred workers in tobacco. He tabulates 102 cases, and finds that 88 had normal vision, which he thinks, is as good a showing as would be obtained from 100 persons taken at random anywhere. He accounts for the reduced vision in the remaining cases, as being other than tobacco, except in two instances, which, he says, may be attributed to tobacco, provided one chooses to do so. Yet he admits that there is no positive proof one way or the other. In each of these cases vision was $\frac{20}{\text{xxx}}$.

If the statements of text-books and observers be taken as the criterion of one's belief, it must be admitted that the existence of this form of *amaurosis* is doubtful. And these doubts are materially strengthened when it is considered that there are no symptoms, taken singly or collectively, which are specially distinctive of or peculiar to tobacco poisoning. On the other hand, the description of the affection is exactly the same as that of retro-ocular neuritis, an affection often observed in individuals who do not use tobacco in any form. And moreover, while general pathologists admit that *tobacco* may cause *functional disturbance*, they do not recognize in it, an agent capable of producing *organic change in any tissue of the body*; whereas, they attribute to the effects of alcohol, changes which are so characteristic as to be pathognomonic of alcoholic abuse. These changes are often seen in the brain in the form of a chronic interstitial inflammation of its membranes, and the same lesions have been observed in the optic nerves from cases of chronic alcoholism. Many believers in *tobacco amaurosis* ascribe *also to alcohol* a form of amblyopia, differing from that produced by *tobacco*, only in presenting a *round* instead of an *oval* scotoma, and a little duller appearance of the optic nerve. Sufferers from *tobacco amaurosis* are almost invariably free consumers of *alcohol*, and however much at variance with the ordinary practice of ophthalmologists it may be, the possible influence of *alcohol* should always be excluded before the diagnosis of *tobacco* amaurosis is made. The same applies, of course, to all the various causes capable of producing amblyopia. And while it must be granted that positive evidence is often unattainable in medicine, it may be insisted upon that inferential conclusions must be based upon observations complete enough to combat adverse opinion.

(21). Mr. Jonathan Hutchinson, who has written very extensively upon the subject of *tobacco amanrosis* presents his views and his experience concerning the subject, in the *Royal London Ophthalmic Hospital Reports for* 1874. He there reviews his previously reported cases, and adds a few others. He confines his criticisms to 64 cases, having excluded 63 cases previously reported as being imperfect; and as Mr. H. is frequently quoted I shall consider this report with some detail. For not only is it referred to as proving the existence of the affection, but his percentage of cures (75 p. c.) is adduced as strengthening his conclusions both as to the nature of the disease and its amenability to treatment. He says of these cases: "No doubt some of the patients were drinking to excess, but most of them were smoking to excess, and such cases prove nothing as to the direct power of alcohol in causing amblyopia." "In a certain number besides these known to be drinkers, habitual indigestion and failure in appetite is noted." "A history of special anxiety or trouble of some kind, or of overwork was given by several (9) patients, and would probably have been even more common if always asked for." "Another small group are noted as constitutionally nervous." And so on follows in regular order, an honest exposition of features presented by other groups of cases, which will enable anyone to formulate his own conclusions.

My analysis of his cases, as obtained from this report, and when possible by reference to the articles in which they originally appeared, is as follows. *Consumers of both alcohol and tobacco*, 26 cases (4, 6, 7, 10, 12, 13, 14, 15, 23, 24, 32, 33, 35, 36, 37, 38, 40, 42, 43, 45, 46, 51, 53, 54, 58, 59). *Clearly of other than tobacco origin*, 5 cases (30, 43, 54, 55, 56). *Probably of other origin*, 21 cases, (1, 20, 21, 22, 31, 32, 35. 36, 39, 38, 40, 41, 42, 46, 47, 48, 50, 51, 61, 62, 63.) *Testing incomplete.* Vision given for first visit and not again referred to, 1 case (52). Reliance upon patient's statement alone, 3 cases (9, 18, 20). Vision for distance taken at first examination only, the subsequent tests being for the near, in which there is improvement, 5 cases, (8, 19, 26, 27, 28). Vision taken for the *near* at both examinations, there being improvement at the final testing, 2 cases (2 and 29), one case (11) had had iritis and floating objects in the vitreous. Three cases (5, 16, 25) are without history. Five cases (3, 17, 49, 60, 64) remained stationary for distant vision, and one case (57) became worse. Two cases (34, 44) had suffered from failure of appetite and digestion, with too little sleep in one case and too much in the other. The vision was respectively in these two cases: $\frac{20}{\mathrm{L}}$ which improved to $\frac{20}{\mathrm{XXX}}$, and $\frac{20}{\mathrm{CC}}$ which improved to $\frac{20}{\mathrm{XL}}$. Thus the 64 cases are accounted for. They all used tobacco, certainly; but that there was any direct connection between the use of that agent and the amblyopia, or between the discontinuance of tobacco and improvement in vision, is far from proven.

(22). *Wordsworth* reports three cases of optic nerve atrophy going on to blindness in subjects who used tobacco, and calls them cases of *tobacco amaurosis.* No evidence is given that other causes were eliminated. The histories are too meagre to justify any conclusions; and, moreover, it is claimed by advocates of *tobacco amaurosis* that this form of amblyopia does not lead to complete blindness.

(23). *Hirschberg*, in an article on tobacco amblyopia, ascribes some cases to *tobacco*, others to *alcohol*, and finally a few, presenting the same characteristics, where neither tobacco nor alcohol was used, are attributed to *retro-ocular neuritis.*

(24). *Webster* reports twenty cases of amblyopia occurring in individuals who used tobacco and alcohol to excess. In one case only was tobacco used alone. The vision in this case was $\frac{5}{CC}$ in each eye when first seen. Tobacco was discontinued, and one week later his vision was $\frac{5}{C}$ in the right eye, and $\frac{5}{CXX}$ in the left. He was then placed, first upon strychnia, and later upon a mixture containing iodide of potash, and three months after he was first seen, vision was $\frac{20}{LXX}$ in each eye. Dr. Webster's experience enables him to "conclude that *amblyopia* from *tobacco* alone does occur, but in this country somewhat rarely." He further states his evident bias in favor of *tobacco amaurosis* as follows: "I must confess, however, that when a man comes to me on account of failing vision, and I find the characteristic 'chloroform ordor' in his breath, and the scent of tobacco issuing from every pore of his skin, I at once suspect that I have discovered the cause of his affection, and am only likely to have my opinion *changed by positive evidence*, ophthalmoscopic or otherwise."

In the discussion which this article elicited at the New York County Medical Society, Dr. Roosa too a strong stand against the theory of *tobacco amaurosis*; and Dr. Pomeroy also doubted its existence. The other speakers agreed more or less completely with the author of the paper. They merely expressed *opinions* however, and adduced no facts to prove the correctness of their views.

Rather early in my practice of ophthalmology I treated a case of *tobacco amaurosis* to a successful termination. I received a rude shock, however, when the patient told me that he had taken my medicine, but had continued the use of tobacco throughout the entire course of treatment. I was forced into admitting my mistake, and became more careful in my observations, and up to the present time I have not seen a case in which I felt justified in making the diagnosis of *tobacco amaurosis.* I present the notes of ten cases which I have treated and think that my views will receive corroboration by the facts illustrated in their histories.

Case I. Jan. 16, 1884. I. D., æt. 60, male, married, shoemaker, a healthy man with a large family, whose individual and family histories are entirely negative. Takes no alcoholic drinks; smokes almost constantly—twenty-five or thirty pipes per day. A searching examination elicits no symptoms or evidences of trouble elsewhere than in the eyes. There has been gradual failure of vision for the past three months. Vision right eye, $\underline{1}\,\frac{1\cdot 2}{cc}$; left eye, $\frac{3}{cc}$. Visual fields show no concentric limitation, but peripheral vision, which is normal in the outermost limits of the field, becomes rapidly reduced as the center is approached. Colors are distinguished in the center of the field, and there is no defect in their peripheral perception, yet they are as bright 20° from the center as they are at the point of fixation. All of which means that the central portion of the retina is impaired, both as to acuity of vision and color perception, while the periphery remains normal in these particulars.[1]

The ophthalmoscope shows a normal fundus, with the exception of the discs, which are a little redder than normal, the veins possibly are enlarged and sluggish. He has the "stale tobacco odor" to a marked degree.

Treatment.—Potassium iodide, gr. v., in infusion of gentian, ʒi, three times a day, the tobacco to be neither stopped nor reduced.

Jan. 18. Vision right, $\frac{3}{cc}$; left, $\frac{15}{cc}$.

Jan. 23. Vision right, $\frac{12}{cc}$; left, $\frac{20}{cc}$.

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[1] See article on "The Field of Vision," by J. L. Minor, *Am. Jour. of the Med. Sci.*, July, 1883.

Feb. 11. Vision $\frac{20}{CC}$ both. Glasses now for the first time improve vision. + 14 s V. = $\frac{20}{LXX}$, both. (Glasses had been tried before, for this degree of hyperopia was recognized with the ophthalmoscope.) The treatment, which up to this time has remained unchanged, is now varied, the gentian and iodide being discontinued, and tinct. of nux vomica, gr. x. t. d., substituted.

Feb. 22. With glasses, vision, right, $\frac{20}{LXX}$; left, $\frac{20}{XXX}$. With + 6 s reads newspaper print.

April 4. With glasses, vision, right, $\frac{20}{L}$; left, $\frac{20}{XX}$. The visual fields have improved *pari passu*, with the vision. The ophthalmoscopic appearances are now normal. The change was so gradual as to be inappreciable during its progress.

May 9. Vision and condition unchanged; works at his trade as well as he ever did.

Case II. May 21, 1880. J. K. aet. 40. Male. Married. Liquor dealer. No history of constitutional or other serious disease. Drinks freely and chiefly whiskey, but does not become intoxicated. Smokes ten or fifteen cigars daily, and often a larger number. For one month and a half vision has been failing. Slight pain in eyes, attributed to strain. No evidence of brain or spinal cord trouble or of any other form of disease. Vision both $\frac{20}{CC}$. No limitation of visual fields, and peripheral acuity of vision is normal. Fields for color not contracted, but there is a central transversely oval scotoma for both red and green, extending from a few degrees to the temporal side of the point of fixation, across to the optic nerve entrance. Ophthalmoscope shows a very low grade of optic neuritis. Treatment: Potassium iodide gr. x. in infusion of gentian ʒi three times daily. Liquor to be stopped and tobaccocontinued.

May 28. Vision $\frac{20}{LXX}$, both. June 4, vision $\frac{20}{XL}$ both. June 20, vision $\frac{20}{XXX}$ both. July 6, vision $\frac{20}{XX}$ both. The color perception is normal throughout the visual field, the scotoma having disappeared. The discs gradually cleared and are now essentially normal. Treatment was continued for a month longer, when it was stopped the condition being the same as at the last testing. The cure is considered permanent, for the patient was told to report again, in event of a relapse; and he has not been seen since. The stale tobacco odor was very noticeable in this patient.

Case III. May 2, 1883. C. W. aet. 46. Married. Liquor dealer. History negative, never having experienced disease of any kind. Drinks, not to excess, but frequently and with regularity. Smokes ten or twelve cigars daily. Vision $\frac{20}{CC}$ both ($\frac{20}{LXX}$ with + 24 s.) Visual fields not contracted and peripheric vision normal. Color fields normal, but there is decided dulness of perception for red and green, in the center of the field. Ophthalmoscope shows optic neuritis of a very slightly pronounced character. No signs or symptoms of disturbance elsewhere than in the eyes.

Treatment—Iodide of potassium in infusion of gentian gr. x t. d. Discontinuance of alcohol—tobacco as before.

May 14, vision $\frac{20}{L}$ both, with + 24.S.

May 20, vision $\frac{20}{XL}$ both, with + 24.S.—Still drinks a little.

June 1, vision $\frac{20}{XXX}$ both, with + 24.S.

June 20, vision $\frac{20}{XX}$ both, with and without glasses. Visual fields normal and color perception normal throughout the whole field. The discs are normal. Cure probably permanent—for the patient did not report again, as he was told to do in event of a relapse.

Case IV. Jan. 30. 1884. D. Q. æt. 50. Male. Married. Laborer. History negative, uses alcohol freely but not to excess. Smokes almost constantly twenty to thirty pipes per day. Vision failing for four months. Can elicit no symptoms of other trouble—Vision, right $\frac{20}{XXX}$, left $\frac{20}{XL}$. Visual fields contracted. Peripheric vision normal. Color field normal. There is no color scotoma, but colors are as readily perceived 20° from the center, as at the point of fixation i. e. incomplete, central colour scotoma—Ophthalmoscope shows a cloudy optic nerve in each eye.

Treatment iodide of potassium gr. v. in infus. gentian. t.d. Alcohol to be stopped—tobacco continued.

Feb. 4. Vision $\frac{20}{XXX}$ both. No defect of visual field or colour perception. Ophthalmoscope shows little change.—When see a month later condition was the same as at last visit. The stale tobacco odor, well marked in this patient.

Case V. Dec. 17, 1882. P. B., æt. 43, male, married, policeman, a healthy, robust man, whose history, both family and individual, is entirely negative. Drinks moderately, but never to excess. Smokes freely and chews almost constantly. Trouble with eyes for a year, muscæ volitantes and reduced vision. Occasional pain in temples, cardialgia, flatulence, constipation. No other symptoms. Vision right, $\frac{20}{L}$, left, $\frac{20}{XL}$; visual fields normal; peripheric vision normal. The only color defect is dulness in perception of red and green in the center of the field over an area of 10° radius. Ophthalmoscope shows a low grade of optic neuritis. Treatment, iodide of potassium and infusion of gentian, to stop alcohol and continue tobacco. This treatment was continued, and no note was made until Feb. 2, 1883, when vision was $\frac{20}{XX}$ both, and color perception normal. Discs normal.

Aug. 5—Relapse. Vision right, $\frac{20}{C}$; left, $\frac{20}{L}$. Low grade of neuritis placed on same treatment.

Sept. 30.—Vision $\frac{20}{XX}$ both. Discs a little cloudy, but less inflamed.

Feb. 1884.—No relapse. Discs normal. Stale tobacco odor very noticeable. Before consulting me, this patient had seen two oculists of repute, both of whom diagnosticated tobacco amblyopia; and, while under their observation, his tobacco was discontinued, and strychnia was administered hypodermically and internally. He experienced no improvement until he placed himself under my care, during which time he used tobacco as freely as he had ever done.

Case VI. April 18, 1883. J. T., æt. 45, male, married, laborer, a strong healthy man. Chancroids twenty years ago, and suppurating buboes at the same time. No symptoms of syphilis. "Never had a day's sickness." Drinks freely, but not excessively. Smokes a great deal and chews almost constantly. Vision failing for past six weeks; can find absolutely no other symptom. Vision, right, $\frac{20}{C}$ left, $\frac{20}{L}$. Fields of vision and peripheric vision normal. Colors as bright at 20 degrees from center, as at point of fixation; otherwise color fields are normal. Ophthalmoscope shows a low grade of optic neuritis. Treatment, potassium iodide and gentian. To stop alcohol and continue tobacco.

May 9, vision $\frac{20}{CC}$ both.

June 15, vision $\frac{18}{CC}$ both, and, finding suggestive whiteness of the outer halves of the discs, iodide was stopped and strychnia substituted.

April 5, 1884. After last visit, vision became so bad that he could hardly find his way about. He gave up his work, became despondent, stopped medicine, and, having nothing else to do, smoked or chewed tobacco during waking hours.

In Dec. 1883, vision began to improve, and, in the course of a month, reached its present condition $\frac{20}{XX}$ both. Visual fields and color fields normal. The discs are normal—has been at work and uses eyes as well as he ever did for reading and all purposes, stale tobacco odor throughout.

Case VII. Aug. 25, 1883. Dr. S. S., æt. 35, oculist. Drinking for a considerable time, not excessively, but freely and regularly. Smokes a great deal. Vision bad one month, though it is now improving. Complains of nothing else than eye trouble. Vision, right, $\frac{20}{L}$; left, $\frac{20}{XXX}$. Fields of vision, color perception, and color fields normal. Pupils small, optic discs hazy, with indistinct outlines. Suggested iodide of potash and discontinuance of alcohol. Allayed the fear of tobacco amblyopia, and told him to continue smoking.

Dec. 1st the doctor writes: "Happy to say my sight has come back to nearly normal without quitting tobacco." This is the statement of an oculist of good standing, who believed, until he was assured to the contrary, that he had tobacco amblyopia.

Case VIII. Jan. 23, 1884. H. K., æt. 40, male, married, laborer, chancre fifteen years ago with some secondary but no tertiary lesions. Gonorrhœa two years ago and now has stricture, uses both alcohol and tobacco to excess. Occasional headaches, and at times, pain in eyes. Failing vision for one month. Vision, $\frac{20}{C}$ each. Visual fields and peripheric vision normal. Color perception dull for green and red in center of field, otherwise normal. Ophthalmoscope shows low grade of neuritis. Treatment, iodide of potash and discontinuance of alcohol. Tobacco continued.

Feb. 28, $V=\frac{20}{XL}$ both. Not seen again.

Case IX. Nov. 1882. T. B. æt. 47, male, married, laborer, has locomotor ataxia of fifteen years standing. Smokes sixteen or eighteen cigars daily, and is temperate in the use of liquors.

Vision bad for more than a year. No other symptoms. Vision $\frac{20}{CC}$ and with + 2 Ds. $\frac{20}{C}$ both. Visual fields concentrically limited. Perception of colors unreliable. Discs, white, atrophic—vessels small. Treatment. Placed upon mixed treatment and told to discontinue both alcohol and tobacco, neither of which was done.

Feb. 1883. Vision, right, $\frac{20}{XL}$; left, $\frac{20}{LXX}$.

April, 1883. Vision $\frac{20}{XXX}$ both. Visual field and color defects remain unchanged. No improvement in symptoms of ataxia or in appearance of discs. Tobacco was never reduced, and stale tobacco odor was noticeable throughout the time during which he was under observation.

Sept. 1883. Vision, $\frac{20}{L}$ both.

Case X. Nov. 30, 1883. H. B., æt. 61, male, married, tailor, one year ago treated for "amblyopia ex abusu," which yielded to a month's treatment (further particulars not noted). Smokes a great deal and drinks freely but not excessively. Headaches, dizziness, occasional sick stomach. No evidence of spinal trouble. Vision, right, $\frac{3}{CC}$; left, $\frac{1}{CC}$. Visual field concentrically limited, color perception unreliable. Ophthalmoscope shows a subsiding neuritis, passing into atrophy. Treatment: Placed upon iodide of potash and mercury, alcohol stopped, tobacco continued.

Dec. 3. Vision, right, $\frac{15}{CC}$; left, $\frac{6}{CC}$.

Dec. 17. Vision, right, $\frac{20}{CC}$; left, $\frac{15}{CC}$.

April, 1884. Condition the same; nerves look whiter.

Tobacco was used excessively in all cases, and its use was continued throughout the entire course of treatment in every instance. In Case I., tobacco alone was used, and the most marked improvement took place, a perfect cure, from a condition of almost helpless blindness.

Alcohol was used in moderation in cases 5 and 9, and freely in cases 2, 3, 4, 7, 6, 8, 10. Its use was discontinued.

Case IX, was probably of spinal origin, and Case X was of cerebral origin.

Vision was improved to $\frac{20}{XX}$ in six cases, to $\frac{20}{XXX}$ in two cases, to $\frac{20}{XL}$ in one case, and to $\frac{20}{CC}$ in one case, which gives us 90 per cent of cases in which either a cure was effected or marked improvement resulted.

I found the iodide of potash the most useful remedy, though strychnia acted beneficially in some cases. I was guided by the appearance of the disc in my selection of the one or the other of these drugs. The iodide was given when the nerves were red, and strychnia when the nerves were whitish.

The first eight cases show conditions of marked similarity, i.e., impairment of the central portion of the retina, both as to visual acuity and color perception, while the periphery remains normal in these particulars. The entire absence of all but eye-symptoms, coupled with the favorable progress observed in these cases, is not suggestive of central origin, and further, the restriction of the trouble to the center of field indicates derangement of only a portion of the conducting apparatus of the eye, and since Samelsohn (25) described the course of the nerve fibers going to the macular region, localization has become possible.

In a case of central amblyopia observed by him during life, opportunity was afforded at the autopsy (death from heart disease) to trace the degenerated macula-lutea fibers from the macula to the optic foramen; at which point the disease began. "In the optic foramen the macula-lutea fibers constitute a circular bundle accompanying the axis of the nerve, and are surrounded equally on all sides by bundles which supply the peripheral parts of the retina." Anterior to the bony canal they pass from the axis to the side of the nerve, preserving, however, their form of a circular bundle until they arrive at the point of entrance of the central artery and vein. The vessels displace the fibers in such a manner that the sectional form of the bundle is wedge-shaped, the base of the wedge forming the side of the nerve, and this maintains until the papilla is reached. The anatomical relations of the nerve at the optic foramen are such as would favor interference with its lymph currents, or with its vascular supply at this point, and furthermore render it more prone to react to such agents or causes as are capable of producing parenchymatous changes. The selection of the center of the nerve trunk by the inflammatory process is attributed to the fact that the nerve is supplied with blood vessels which enter at the surface, and have their finest capillary plexuses, and therefore their most active interchange of fluids at the center. Such organs as the liver and kidney, which are supplied by blood vessels ramifying from a central main trunk towards the periphery, suffer when inflamed, first and most in their peripheral parts.

Retro-ocular neuritis then, located at the optic foramen, offers the most plausible explanation of the conditions observed in the first eight cases, the changes in the papilla being secondary to this. And as to the cause of this post-ocular neuritis, it may be confidently asserted that tobacco took no active part. Alcohol is capable of being harmful, and is, I think, undoubtedly, responsible for some cases of retro-ocular neuritis. But it must be borne in mind that other causes are equally as important, and that differentiation is usually difficult and often impossible. The number of my cases is too small for general conclusions, but the improvement which was uniformly noted compares most favorably with figures given and claims made by Mr. Hutchinson and others, in reports upon *tobacco amblyopia*, when the discontinuance of tobacco was considered the most important step in treatment. The last two cases are related because they illustrate the marked improvement which may take place while tobacco is being excessively used. The cause of the eye trouble, in each instance, is to be sought in the central nervous system; yet, had discontinuance of tobacco been one of the elements of treatment, the improvement in vision would have been attributed to that fact by many observers, and the cases at once accepted as proving *tobacco amaurosis* would find their way into medical literature there to aid in buoying up a time honored, but very loosely applied, medical term.

Since writing the foregoing an article (26) by Dr. Coleman, of Baltimore, has come to my notice. He found "out of eighteen hundred and twenty-four eye cases, forty-six who had partial or total loss of sight, accompanied by conditions similar to those noticed in *tobacco amblyopia.*" Thirteen cases were attributep to *tobacco*; nine to *tobacco* and *alcohol*, and twenty-four to *other causes.* Thirty-nine cases presented changes about the optic disc, and seven none whatever, and of these seven only one was attributed to tobacco. Considering the obscurity of many forms of disease of the nervous system which may have impairment of nutrition or of function of the optic nerves as a part, I should say that the use of tobacco was a coincidence in his cases; and the improvement which was observed, I should attribute to the medicinal agents employed, or to the natural course of the disease, and not to the discontinuance of tobacco. I am aware that Foerster, Nettleship, Berry and others have reported cases where discontinuance of tobacco alone, without other treatment, was followed by marked improvement in vision. And these cases are at first sight strongly suggestive of a tobacco origin. But my own cases, in which improvement and cures resulted while tobacco was being excessively used, will off-set such an hypothesis, and disprove any conclusions drawn therefrom. The disease occurring as it does, in neurotic subjects, and resembling in many respects the *hereditary amblyopia* of Leber, and the *retinitis nyctalopia* of Arlt, shows to my mind no alliance with nor dependance upon tobacco.

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TWO CASES OF DISEASE OF THE OPTIC NERVES DUE TO CEREBRAL AFFECTIONS.

BY DR. C. BARCK, ST. LOUIS, MO.

I. K. R., aged five and a half, of German descent, was brought to my office Nov. 20, 1884, on account of failure of sight. The patient is a healthy looking, well developed girl; she has had no sickness besides the usual children's diseases. During the last three months she has frequently complained of slight headache, and for several weeks she has vomited regularly after meals. She was treated for a disease of the stomach. In the last two weeks the vomiting has stopped, but the headache was severer. Since that time the parents noticed that the girl could not see as well as before. She began to stumble when playing on the streets, became unable to thread a needle, which she was accustomed to do. During the last two or three days vision declined so rapidly that she could find her way with difficulty only.

The girl is the oldest child; she has one brother and one sister. Her grandparents and the mother are healthy. Her father is a strong-looking man, but potator. Neither eye diseases nor nervous diseases have so far been observed in the family.

The examination revealed: Both pupils nearly ad maximum dilated and reacting but slightly. V. R. cannot count fingers, but sees the hand excentrically, perception being preserved in the outer and upper regions of the retina.

V. L. counts fingers at one metre. Media clear. The ophthalmoscope reveals in R. a grayish-white, sharply defined, atrophic disk; arteries small. L. choked disk. The swelling of the papilla is of medium size; the outlines are indistinct and the surrounding retina is infiltrated to a considerable extent. The veins are enlarged and tortuous. The visual field could not be examined on account of the patient's age. The color perception is preserved to a certain degree; she distinguishes blue, red and green. An examination of the heart, lungs and urine shows nothing abnormal. No fever. Sensibility and locomotion are normal; patellar reflex strong. No swollen glands are to be found; the teeth well developed, with the exception of the two lower incisor teeth which are shorter than normal, more transparent, and have rounded off, serrated edges.

The usual treatment was applied, consisting of Heurteloup, pilocarpine injections, iodide of potassium, etc., but without effect.

December 15, 1884. Patient has had a slight headache off and on; no vomiting. Vision R. and ophthalmoscopic appearance the same. L. Swelling of the papilla and infiltration of the retina reduced. Vision increased to counting fingers at 1½ metres.

January, 1885. No headache, nor vomiting. The retinal infiltration and swelling of the disk in the left eye have nearly disappeared; some white patches are making their appearance in the retina. V. has somewhat decreased. Color perception is more uncertain. The girl, who was intellectually well developed, is decidedly declining in this respect.

February 12, 1885. After two days' severe headache and vomiting, the left arm and left leg have suddenly become paralyzed. The headache is felt severest at the right side of the occiput. There is also a slight facial paresis of the right side.

The patient was now confined to bed for about six weeks. The headache persisted for one week; then the paralysis began slowly to disappear, first in the arm, then in the leg. After two months she could walk. The ophthalmoscopic appearance is now nearly the same in both eyes, viz., an atrophic disk. Color perception is nearly lost.

April 1885. Patient was severely frightened and cried during a thunder storm. This was followed by pain in the back and a restless night. The next morning both legs were paralyzed; she had incontinentia alvi for two days; there was no incontinentia urinæ but urinating was difficult. This paralysis subsided more rapidly than the first, so that the girl could walk a few steps two weeks later. She was sent to the country.

Last examination December 16, 1885. Patient is reduced in strength and intellect; she walks with difficulty and drags the left leg. The patellar reflex is rather increased on both sides, V. R. perception of light. V. L. counts fingers at ½ metre; color perception abolished. Ophthalmoscopic appearance not much altered.

II. L. N., aged 19. The family physician, Dr. A. Kleinecke, with whom I saw the case, gave the following history: This patient had been a strong, healthy girl until two years ago. Had had frequent attacks of malarial fever but not otherwise been sick. Her mother, three sisters and one brother are healthy; her father and one sister died from acute pneumonia. There are no nervous or mental diseases, nor is there any lues in the family.

About two years ago the patient began to suffer from more or less severe headache and gastralgia. In the summer of 1884 while she was working, sudden paresis of the right leg and arm appeared after a fright. She had clonic spasms in this leg for some hours, and respiration was difficult. The paresis afterwards became changeable, but grew slowly worse. The headache was since this time nearly constant, but most severe in the morning, and most pronounced in the occiput. Lungs and heart were normal.

For about six months sight has been failing. The first examination, October 10, 1885, showed in both eyes a swollen and infiltrated optic disk, with indistinct contours and infiltration of the surrounding retina; the veins were considerably enlarged and tortuous. V. R. counts fingers at one metre; V. L. $\frac{3}{cc}$.

The following weeks she was mostly in bed. The leg now became totally paralyzed.

December, 1885. V. R. perception of light. V. L. counts fingers. In the R. E. the swollen disk changed into a white atrophic one.

January, 15, 1886. The last three weeks the patient suffered from violent vomiting and severe headache. She is now very weak and hardly able to answer. V. both 0. for about two weeks. R. E. as before, L. E. papilla not markedly swollen, but infiltrated, its limits indistinct. Arteries small. The left patellar reflex is strong, the right one rather increased.

REMARKS.—The first case was seen twice in consultation with Dr. L. Bremer, of this city. A definite diagnosis was not arrived at, the affection being considered due to a cerebral tumor or to a chronic basilar meningitis, the latter being the most probable. In favor of this diagnosis I may refer to the comparative amelioration after the severe paralytic symptoms, to the sudden beginning and the rapid course of the visual trouble in comparison with the slow course of the general disease and to the lack of constant headache. But the diagnosis of a cerebral tumor cannot be excluded with certainty. No cause for a tubercular meningitis is to be found. From the beginning I tried to find out whether there was any syphilis present, but I saw the father of the child only once, and he was not inclined to answer questions pointing in this direction. The younger sisters of the patient are healthy, and the mother never miscarried. The formation of the patient's *lower* incisor teeth, resembling exactly Hutchinson's teeth, was certainly striking. But this author mentions only the abnormity of the *upper* incisors and *second* teeth as indicative of syphilis. Our patient was only five and a half years old. Moreover during the course of the disease mercury has been given without effect.

The second case was seen in consultation with Dr. Wm. Hasard. It is a more typical case, and the diagnosis of a tumor of the brain, and probably of the cerebellum, is not likely to find any objections.

I would have preferred to relate these cases after a post-mortem examination had been made; but, as we will very probably not be allowed to make one in either of the two cases, it seemed to me unnecessary to wait with the report for their fatal termination, since the disease of the optic nerves has run its course in both. The gradual change of the choked disks into atrophic ones could be well observed in both cases. The strong patellar reflex, which was even increased in the paretic legs may here be especially mentioned in contradistinction to the diminution or lack of this reflex in atrophy of the optic nerve connected with tabes dorsalis.

CORRESPONDENCE.

"36" OR "40"—WHICH SHALL IT BE ?

Mr. Editor

With the increasing use by oculists of the metric system in measuring errors of refraction and in ordering correcting glasses, our opticians have sought to approximate glasses ground according to their focal distance in English inches by calling the unit, or Dioptre, 40 inches.

Most lenses are now ground here, but it is probable that the trial-cases in use by oculists are, ordinarily, of foreign make.

Therefore if, for example, glasses of + 1 D. are ordered, and the dealer, not having imported ones, gives his + 1 D. or + 40, they are manifestly too weak, just as an American + 36 is weaker than a Nachet's + 36.

This is easily verified even without a phakometre. On testing + 1 D. from my box (Roulot) with Badal's little phakometre it was found to be slightly stronger than an American + 36.

Now in many instances the difference between 36 and 40 might not be of any practical importance, while in others it might have a deleterious effect.

If the oculist corrects his patient's vision with a French or German lens, he naturally, in ordering, expects the optician to furnish one of the same power. In Dr. Landolt's paper on The Metrical System in Ophthalmology (R. L. O. H. Rep. May, 1876, translated by Dr. Swan Burnett) is a table similar to that appended to Snellen's Test-types, ed. 1875, which gives the refracting power in Paris inches of metric lenses, and which the writer has followed most satisfactorily for nearly nine years in prescribing spherical glasses from local dealers—though chiefly for patients of small means.

It is to be devoutly hoped that "approximation" may not be long required but it seems often necessary at present to those who live far from the madding crowd of our large towns.

Aside from the fact that a + 36 American lens is nearer the standard Dioptre (37 French inches) than is a + 40, it possesses, also, a further advantage in being a greater common multiple.

It seems desirable to start right in this matter. Now it is well-known that some years ago the U. S. Marine Hospital Service undertook to introduce cubic centimetres, instead of weights only, in prescription-writing, for which there was not any authority abroad.

Thus early in the adoption of the metric system as applied to oculists' orders, it surely would not be difficult—if thought best—to change the value of the "American Dioptre" as it stands today?

Salem, Mass., 1886. D. Coggin.

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VOL. III. MARCH, 1886. No. 3.

ON SPECTACLE LENSES OF ASYMMETRICAL CURVATURE.

BY JOHN GREEN, M. D., ST. LOUIS.

As astigmatism, whether simple, compound or mixed, may be reduced, as an optical error, to terms of asymmetrical refraction at the anterior surface of the cornea, so its correction would naturally be sought in a lens with a surface of correspondingly asymmetrical curvature. In the case of simple hypermetropic or myopic astigmatism, this condition is fulfilled by a convex or concave cylindrical lens, and in compound and mixed astigmatism we similarly prescribe a lens combining a cylindrical surface, to equalize the refraction of the eye in its two principal meridians, with a spherical surface of such radius as may be required to correct the remaining ametropia. By these combinations, which have been adopted on account of especial convenience and consequent economy in manufacture, we obtain lenses of asymmetrical refraction, whose meridians of greatest and least refraction are determined by the direction of the axis of the cylindrical surface.

In the presence of a relatively high grade of ametropia, we occasionally correct a relatively low grade of astigmatism by means of a spherical lens, of a focus determined by the measure of the (nearly horizontal) meridian of least ametropia, mounted somewhat obliquely to the direction of the axis of the eye. In certain other cases in which a relatively low grade of astigmatism has been left uncorrected, the wearer similarly learns to improve his acuteness of vision by regulating the carriage of his head so as to enable him to look obliquely through his spherical glasses. The obliquely mounted spherical lens, like the lens ground with a spherical and a cylindrical surface, is practically equivalent to a lens of asymmetrical curvature with its meridian of greatest refraction at right angles to the axis about which the plane of the lens is rotated.

Concave lenses of asymmetrical curvature have been produced by glass-cutters, probably from the time of the first invention of their art. Examples of such lenses are seen in the polished punty mark which is ground in the bottom of decanters and drinking glasses, and in the shallow depressions with which glass-cutters are in the habit of studding the surface of lamp globes, and of decorating panes of ground glass which are intended to transmit light without permitting objects to be seen distinctly through them. These concave surfaces are ground upon a revolving wheel rounded at its periphery, and have the form of spherical segments whenever the radius of the curved periphery is exactly equal to the radius of the wheel. In all other cases the polished surface is of asymmetrical curvature, and when ground upon a flat plate of glass, forms a plano-concave lens of asymmetrical refraction, such as is required for the correction of a case of compound myopic astigmatism.

If such an asymmetrical depression is ground on one of the surfaces of an ordinary double-convex lens, whose opposite spherical surface is of the same radius of curvature as the radius either of the grinding wheel or of its curved periphery, the resultant lens will be the optical equivalent of either a concave or a convex plano-cylindrical lens, but it will be of the meniscus or periscopic form, with both its surfaces curved in all meridians. In like manner, the asymmetrical concave surface may be ground upon one side of either a double- or plano-convex, or a double- or plano-concave spherical lens, of any desired radius of curvature, and thus a concave or convex meniscus, or a double-concave lens, may be ground of any required refractive power in each of its principal meridians.

If we make the wheel hollow, and use the concavity of its periphery as the grinding surface, we may, similarly, produce lenses with an asymmetrical convex surface, and by grinding this asymmetrical surface upon one side of an ordinary double-convex lens we obtain a lens of asymmetrical refraction, of the double-convex form.[1]

If we groove the periphery of the grinding wheel so as to give to it the form of a pulley, the lens-surface ground upon it will be concave in the meridian corresponding to the plane of the wheel and convex in the other principal meridian. Such a lens approximates quite closely, in its optical properties, to a lens with crossed + and — cylindrical surfaces, or with a + or — spherical combined with a — or + cylindrical surface, such as is ordinarily prescribed in a case of mixed astigmatism.

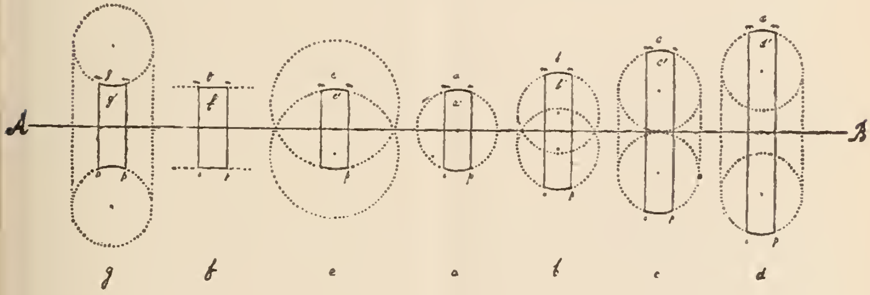

Fig. 6.

Figure 6, *a*, *b*, *c*, *d*, *e*, *f*, *g*, represents, in cross-section, a series of grinding wheels, *m n o p*, in which the radius either of the wheel or of its curved cutting periphery is taken of different values. If we represent the radius of the wheel by R and the radius of the cutting periphery by r we may take.

(*a*) $R = r$, in which case the periphery of the wheel will be an

---

[1] Such a lens is practically equivalent to a double-convex lens with crossed cylindrical surfaces of unequal radii, and, inasmuch as the double-convex form yields lenses of the lightest possible weight, a double-convex lens of one or the other of these types may offer a certain advantage in the correction of astigmatism in the aphakial eye.

equatorial zone of a sphere, and the lens-surface ground upon will be a concave spherical segment; or

(a') $-R = -r$, in which case the lens-surface will be a convex spherical segment.

If, varying R, r remaining constant, we take

($b, c, d,$) $R > r$, or ($b', c', d',$) $-R > -r$, the limiting form of the resultant figure of revolution will be an open ring (d, d'), and the lens-surfaces ground upon its peripheral zone will be either concave or convex, and of asymmetrical curvature.

If, varying r, R remaining constant, we take

(e) $r > R$, or (e') $-r > -R$, we obtain an ovoid figure of revolution with pointed ends (e), upon whose equatorial zone may be ground either a concave or a convex lens-surface of asymmetrical curvature, corresponding, in its two principal sections, to the radii of the grinding surface of the wheels, b, c, d.

If we take

(f) $r = \infty$, or (f') $-r = \infty$, the figure of revolution becomes a cylinder, and the lens-surfaces ground upon its outer and inner surface will be concave-cylindrical and convex-cylindrical respectively.

If

(g, g') we assume a negative value for r, the resultant figure of revolution will be concave in one of its principal sections and convex in the other, and the lens-surfaces ground upon its equatorial zone will similarly be convex in one principal section and concave in the other. These several grinding surfaces may be described as generated by the revolution of an arc of a circle about its chord, or about a line parallel to its chord, as an axis. The limiting form of a ring is reached when the arc is taken equal to 360°, or a whole circle, in which case the chord becomes a tangent (figure 1, c): when the axis of revolution is taken outside the circle an open ring is generated (figure 1, d).

Figure 7, which represents an open ring in its cross and median sections shows the several forms of asymmetrical grinding surfaces, as given in figure 1, b, c, d, g and b', c', d', g', and also the two principal sections of each of the lens-surfaces ground upon them. These principal sections are, by the conditions of the construction, arcs of circles with R and r as radii, and the intermediate sections, in the cases b, c, d, and b', c', d', may be roughly considered as small arcs of circles with radii less than R and greater than r.* In the case g, g', the two principal sections are circular arcs, of which the one is convex and the other concave, and somewhere between these are two other sections which may be considered as practically straight lines.† All sections intermediate between these and the two principal sections may be roughly considered as small arcs of circles, with radii varying on the one hand between the limits ∞ and R,‡ and on the other hand between the limits ∞ and $-r$.§

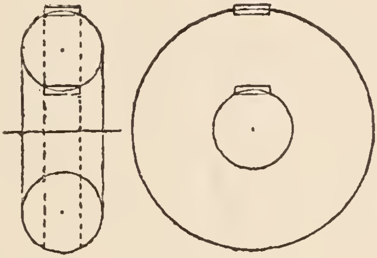

FIG. 7.

In the case (e) $r > \text{R}$ or (e') $-r > -\text{R}$, as in the cases b, c, d and b', c', d', the two principal sections of the grinding surface are arcs of circles with R and r as radii, but the intermediate sections, which may be roughly described as small arcs of circles with radii less than r and greater than R, are really curves of a different form from the oblique sections of the ring.¶

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* This statement is true only in the qualified sense that any very small arc may, without important error, be considered as equivalent to an arc of some circle. If the curved periphery of the wheel is taken as an equatorial zone of an oblate ellipsoid (figure 8), all sections by planes perpendicular to the axis will be circles, and all other plane sections will be ellipses or arcs of ellipses.

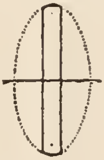

FIG. 8.

At the annual meeting of the American Ophthalmological Society, July 15–16, 1885,[1] Dr. G. C. Harlan exhibited a number of lenses with surfaces of asymmetrical curvature ground upon tools corresponding in form to a small peripheral segment of a wheel, as shown in section in figure 1, *b*, *c*, *d*, and perhaps *e*. These lenses, from the work-shop of Mr. I. L. Borsch, of Philadelphia, were ground by an oscillating motion of the tool or of the lens about the line A B as an axis. Such lens-surfaces represent very nearly the optical equivalent of the different combinations of a concave- or convex-cylindrical with a concave- or convex-spherical surface, and, when ground upon one side of an ordinary

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† This condition will be exactly fulfilled if the pulley surface is taken as a hyperboloid of revolution of one sheet (figure 9). ‡ The sections intermediate between these straight lines and the equatorial section of the wheel will then be arcs of ellipses, § and the other sections will be hyperbolas.

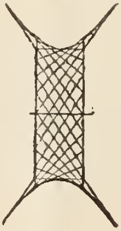
Fig. 9.

¶ If the grinding periphery of the wheel is taken as an equatorial zone of a prolate ellipsoid (figure 10), all sections by planes perpendicular to the axis will be circles and all other plane sections will be ellipses or arcs of ellipses.

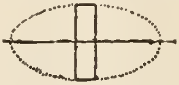
Fig. 10.

For an analysis of the oblique sections of the open ring, shown in its principal sections in figure 2, I am indebted to the kindess of Professor E. A. Engler, of Washington University; of these sections two are *lemniscates*, and the others are either *ovals of Cassini* or other ovals not ellipses.

[1] Transactions of the American Ophthalmological Society, 1885, page 96.

double-convex lens, may yield lenses equivalent to either a concave or convex-cylindrical lens or to any required combination of a cylindrical with a spherical surface. As now manufactured, these lenses can be furnished only at a cost considerably greater than that of the ordinary spherico-cylindrical combinations, over which they appear to offer no very important advantage.[1] Should any considerable demand arise for such lenses it will doubtless prove more economical to grind them upon revolving wheels, rather than upon the small tools used by Mr. Borsch. They may then be manufactured in large quantities and kept in stock, as is now the case with plano-cylindrical lenses, leaving the formula to be completed by the addition of any required spherical surface. At the very least, the number of different values of r to be provided must be equal to the series of plano-cylindrical glasses as now manufactured, and this number must be multiplied several fold in order to provide for the minimum number of required values of R.

It would seem hardly necessary to repeat the elementary proposition that the formula for any combination of two cylindrical surfaces may always be reduced to an equivalent formula in terms of one cylindrical and one spherical surface. Two cylindrical surfaces with crossed axes need, therefore, never be prescribed, unless for some reason wholly independent of optical requirements; still less need we ever demand of the optician to grind two cylindrical surfaces with axes of any other inclination to each other than 90°, even though such a combination may have been arrived at empirically, as the result of experimental testings with the Stokes lens or with casual combinations of plano-cylindrical trial-glasses.

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1. The possibility of making these lenses of the meniscus or periscopic form admits of certain minor refinements, in special cases, not always so perfectly attainable by combinations of a convex or concave spherical, with a concave or convex cylindrical surface, or of plus and minus cylindrical surfaces with crossed axes. *cf.* note on page 55.

SCINTILLATING SCOTOMA (AMAUROSIS PARTIALIS FUGAX) AS EXPERIENCED BY THE WRITER.

BY ADOLF ALT, M. D.

Scintillating scotoma has before this been carefully described by authors who themselves had experienced it (Wollaston, Listing, Vater, and Heinicke and others) yet I am in the position to add to theirs one more observation, of which I was object and subject at the same time, and I think its description may be of interest as the affection is a comparatively rare one.

There seems to be no doubt but that this affection is a purely nervous one which, as a rule, passes off without any consequences of any importance. Leber states that it is so frequently combined with nervous headache, that he has no doubt the two affections belong intimately together.

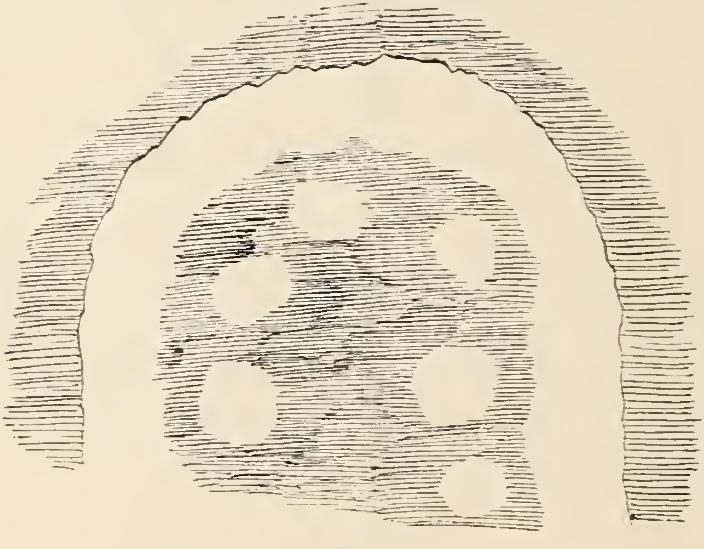

Fig. 11.

Some three weeks ago having become rather anæmic, and generally low in my constitution by continued indigestion and diarrhea, mental labor and worry, I drove on a sunny morning down to my office. The ground was covered with snow. Presently I saw on the back of my horse and to the left of him a bright yellowish semicircle, rather resembling a horse shoe, and inside of it a number of yellowish bright spots arranged almost like the nails belonging to this horse shoe (see figure 11). I thought at first that the reflex from the snow had caused this appearance; but wherever I looked there it was before me, apparently about five feet distant and to the left of the fixation point, but not touching the latter, and it was the same whether I shut one eye or both. About five minutes after first noticing the bright semicircle, I reached my office. At once testing my vision I found that the picture was changed The semicircle was now somewhat smaller, the bright points inside of it were gone, and its outer periphery was varying continually, apparently consisting of shooting rays of light in uninterrupted motion. They were of various colors, but yellow and blue were predominating.

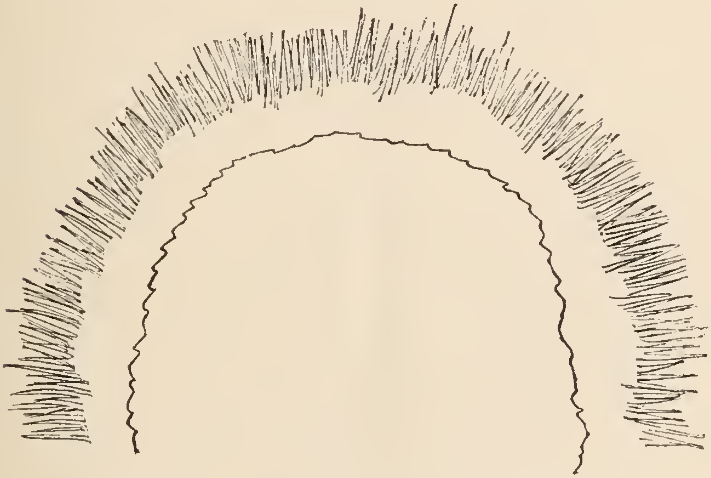

Fig. 12.

I have tried to give an idea of this condition in figure 12. My vision was now reduced to $\frac{20}{L}$, and when I looked at the test card the letters seemed in continued motion and crowded from the right to the left. I began now to feel so weak that I gave up observation for a time, and waited patiently for the effect which several doses of sherry would have on my condition. After about five minutes I began to feel stronger again and then found the picture changed once more. The semicircle was larger and its periphery instead of consisting of shooting rays altogether, had a crenated appearance like the battlements of an old fortress, only here and there some shooting rays would yet appear; and and this crenated outline also changed its shape continually.

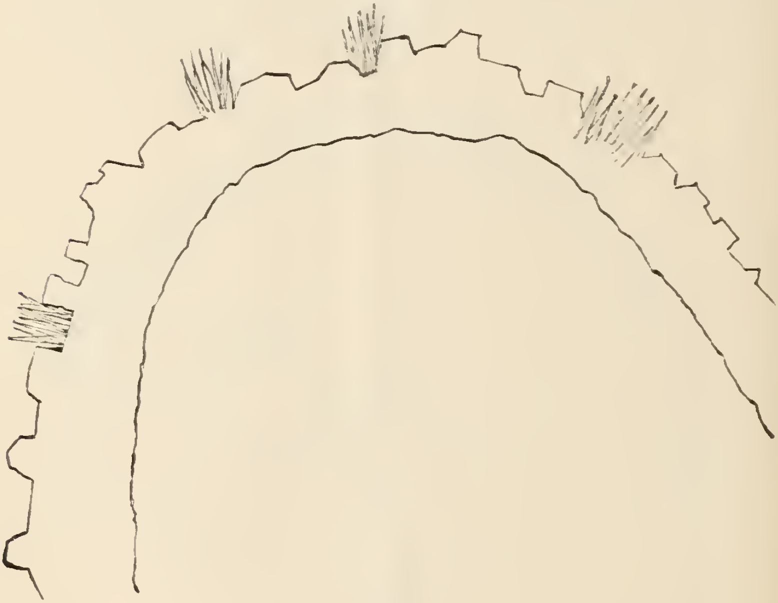

Fig. 13.

(See figure 13.) From this on the circle grew larger and larger, the continued motion became more and more reduced, the brightness seemed to fade away and finally was gone. The whole attack lasted about from 25 to 30 minutes. My head felt a little dull after it, but this may have been and probably was due to the sherry. I have never had any similar affection before, nor since.

The center of the visual field was evidently but slightly affected, and the scotoma lay throughout the attack somewhat to the left of it. It was, moreover, as I stated before, from the beginning observed in both eyes, and in the same portion of the visual field in either eye.

It may not be out of place to give here a few of the remarks made by Leber (Græfe & Saemisch, v. 2, p. 944, etc.) on this affection. He says:

"The center of the visual field is usually left free during these attacks, but it may be affected also.

"In the hemianopic form (in some cases a pure hemianopia has been observed) different halves of the visual fields may be attacked during different attacks.

In most cases both eyes are affected, and this is, perhaps, al ways the case. Although several observers state that one eye only had been affected, or that the second one was affected later than the first, this point is very difficult to settle. Good observers confess that they could not make out clearly whether the affection was monocular or binocular, because it continued even when the eyes were closed. Yet the central location of the affection, which can hardly be doubted, supports the opinion that it is always binocular, although the possibility of a purely monocular central disturbance of vision can, as yet, not be denied with certainty.

Most observers state the duration of the attack to be about half an hour; but it may vary between a few minutes and several hours. * * * * *

The frequency of the attacks varies considerably. Some individuals have only one or a few attacks during their life; with others they are repeated oftener, with free intervals of months, weeks, and days; several attacks have been observed to recur during one day. In some individuals the attacks are frequent only at times, or they occur during a limited period of life only.

The attack is usually followed by a more or less severe headache, which is sometimes hemicranial, especially when the attack was a hemianopic one. The headache may be on the same or on the opposite side. It has the true character of nervous headache, and leads to nausea and vomiting. Sometimes, however, it is very mild, and the disturbance of vision is only followed by a little nausea and fatigue. * * * * *

These attacks of nervous blindness are often observed in literate men, and generally in individuals who do much mental work; they are probably not more frequent among natural scientists and physicians than among other members of the scientific professions, but have been better observed among them, and been more frequently described on account of their great theoretical importance. Some individuals suffer from this affection all their lives; in others the attacks come at times only, and may then be brought into connection with bodily or mental exhaustion, fatiguing scientific or professional labor, want of sleep, etc. In others a neuropathic disposition is at the base of it. * * * *

Some individuals can suppress an attack by means of a glass of wine or liquor, a cup of tea or coffee, calomel in an aperient dose (when there had been constipation), by dipping the hands into hot water, by slight but often repeated contusions of the head by beating it with the flat of the hand, by means of washing the eyes in cold water, etc. Most patients feel easiest during the attack by keeping as quiet as possible, with their eyes closed, and find the attack passing off in the quickest manner in this way."

From the foregoing remarks of Leber my attack seems to have been a rather typical one of this affection. There is only one point on which we disagree. I have never before nor since this attack of scintillating scotoma been subject to hemicrania; yet my mother was a frequent sufferer from it, and has, as far as I can now understand it, been often attacked by this form of scotoma.

A CASE OF ACUTE LOCALIZED CHOROIDITIS.

BY J. OSCROFT TANSLEY, M. D.

Assistant Surgeon to Manhattan Eye and Ear Hospital, New York City.

F. S. æt 19 years. Engineer. Athens. N. Y. sent to me by Dr. Schoonover, August 7, 1881: Says he has always considered himself slightly shortsighted, as he was not able to see objects at long distances as clearly as some of his friends: but never had any trouble with his eyes until one week ago: then came a slight blur over the left eye, with very slight pain. Never had syphilis, nor headache of any serious amount, certainly not recently, and considers himself perfectly healthy.

R. V. = $\frac{20}{XXX}$; w. — $\frac{1}{36}$ c. ax 100° = $\frac{20}{XX}$.
L. V. = $\frac{20}{C}$; w. — $\frac{1}{30}$ c. ax 90° = $\frac{20}{XXX}$.

He has no blur when using these glasses. Reads $\frac{20}{XX}$. easily and pleasantly, and says he *never saw better*.

His fields of vision—in each eye—without glasses, are both alike and of normal size and shape. Oph. Exam. Right eye normal in every particular. Cannot be sure of the astigmatism. Left eye. Cornea clear; there are two quite large plaques of opaque nerve fibers above and below the disc, which are upon their apices hyperopic + $\frac{1}{48}$ while the rest of the fundus looks slightly myopic. I cannot make out the astigmatism. The superior and inferior vessels pass directly over these plaques, but they are not hidden excepting at their very exit from the disc. Here they are disguised by a hazy material which is a species of perivasculitis, and which can be traced to the finest ramifications of all the vessels of the eye. The veins are somewhat tortuous, but not markedly congested or enlarged. The macula can be easily seen, and is normal, but about the macula, for an area of which the macula would be the center and the disc the periphery, there is a hazy indistinct appearance which is suspicious, and consists of lights and shades in rows like the furrows of a plowed field, and which also seems to dance about like a play of shadows. Using homatropia this appearance is somewhat modified, yet remains quite marked superiorily, temporally, and inferiorly of the macula; these rows seem to take nearly the direction of the astigmatic axis but not exactly; at one place they pass directly over a vessel, but do not disguise or change its appearance.

The vessels seem to come nearer to the macula than normal, and are slightly tortuous. I cannot think there is anything pathological, but deem the trouble complained of, to be dependent upon the astigmatic error of refraction and which has just become manifest to the patient. Yet, the fundus appearance is suspicious and justifies keeping the case under observation.

The urine is normal to acid and heat test.

August 14, 1881. Patient says that the shadows are slightly more manifest than when last seen.

R. V. = $\frac{20}{\text{XXX}}$; with — $\frac{1}{40}$ c. ax. 90° = $\frac{20}{\text{XX}}$. L. V. = $\frac{20}{\text{C}}$; with — $\frac{1}{0}$ c. ax. 90° = $\frac{20}{\text{XXX}}$.

Cannot see as well with — $\frac{1}{30}$ c. which was the strongest accepted upon last visit.

Ophthalmoscopic examination. Almost directly below the macula and a little to the temporal side is a large spot of acute choroiditic exudation which is bulging out into the vitreous; its apex being about + $\frac{1}{48}$, while the surrounding fundus is about — $\frac{1}{24}$. The vessels pass up and over the spot, and are not disguised in the least. It is white and about the size of four discs; it has not invaded the macula. The shadow like appearances about the macula. noticed a week ago, are the same as then. This condition certainly was not present at the last visit, because the macula region was especially and carefully examined: it is possible that the bulging might have been there to some extent and the slight localized hypermetropia have passed unnoticed, but the appearances were surely only what I mentioned in my last notes.

Diagnosis is now of course localized choroiditis; the retina not being much of any affected yet. Put upon inunction of ung. hydrarg. and increasing doses of kalii iodidum.

August 17. L. V. $\frac{20}{\text{CC}}$; with — $\frac{1}{20}$ c. ax. 90° = $\frac{20}{\text{XL}}$.

Examination shows a lessening in the density of the exudate, but an increase in dissemination; the macula cannot be as easily made out, being a little cloudy; the vessels of this part are becoming slightly disguised, particularly the descending temporal artery and vein, which pass along the lower border of the spot, and the retina here is evidently becoming slightly œdematous. There are to be seen to-day the characteristic spots of deposit on the membrana Descemet, of the so-called serous iritis. Increased inunctions and kalii iodidum.

August 19. Not much change in appearance, descending artery is slightly more disguised; also think the macula a little less clear. The Descemetric membrane spots somewhat increased. Several light colored opacities are to be seen in the vitreous with a $+\frac{1}{24}$, $+\frac{1}{16}$ and $+\frac{1}{12}$ in the ophthalmoscope, but with no stronger lens. They are mostly, if not entirely, upon the temporal side.

August 21. L. V. $= \frac{20}{CC}$; w $-\frac{1}{20}$ c. ax. 90° $= \frac{20}{XXX}$ —. The serous iritic spots on cornea are less in number; opacities in vitreous, more diffuse; macula seems clearer and healthier; the white exudate thinner and less *woolly.*

August 23. L. V. $= \frac{20}{C}$; with $-\frac{1}{20}$ c. ax. 90° $= \frac{20}{XXX}$, corneal spots about the same, vitreous also about the same, but the exudate in choroid and serum in retina have become markedly thinner.

He says he still sees as though looking through something dusty but thinks the blur is thinner.

August 26. L. V. $= \frac{20}{L}$; with $-\frac{1}{20}$ c. ax. 90° $= \frac{20}{XXX}$ +. Exudate very much thinner; the center of the spot is becoming very white or rather more *clearly* white.

August 28. L. V. $= \frac{20}{C}$; with $-\frac{1}{20}$ c. ax. 90° $= \frac{20}{XX}$ —; corneal spots almost gone; the rest about the same as when last seen.

August 31. L. V. $= \frac{20}{C}$; with $-\frac{1}{20}$ c. ax. 90° $= \frac{20}{XX}$ —; choroidal exudate much thinner and clearer; small bright spot of glistening cholesterine over the descending temporal artery which was not present previously.

September 7. L. V. $= \frac{20}{LXX}$ with $-\frac{1}{30}$ c. ax. 90° $= \frac{20}{XX}$ — will not accept the $-\frac{1}{20}$ c used previously. The macula looks much clearer, and the exudate is disappearing but not so rapidly as previously. No corneal spots to be seen.

Sept. 17. L. V. $= \frac{20}{XXX}$ —; with $-\frac{1}{36}$ c. ax. 90° $\frac{20}{XX}$. Says there seems to be a net work or spider web before the eye.

The cornea is absolutely clear, as is also the vitreous; retina very much better. Told to continue as before.

Sept. 23. L. V.$=\frac{20}{XL}$; with — $\frac{1}{36}$ c. ax. 90°$=\frac{20}{XX}$ +.

Everything looks nicely; ordered to stop inunction and the solution of kalii iodidum and take syrup. ferri iodidi ʒi; with kalii iodidi gr. vj. t. d.

Sept. 29. L. V. $=\frac{20}{XXX}$; with —$\frac{1}{48}$ c. ax. 90° $=\frac{20}{XX}$; cannot accept any stronger glass than —$\frac{1}{48}$ c. Has now no cloud, dimness or opacity of vision with it without glasses. Cornea and vitreous perfectly clear; retina very much improved; there are several very bright and glistening spots of cholesterine in the retina just below the macula which have not been visible before. Told to continue the syr. fer. iodidi. c. kal. iodid. t. d. for three weeks and return.

Nov. 1, '81. R. V. $=\frac{20}{XXX}$, with — $\frac{1}{36}$ c. ax. 100 $=\frac{20}{XX}$.
L. V.$=\frac{20}{XX}$. E. *will not accept any glass.*

The macula is normal and healthy; the spot of atrophic choroid is clear and white; the vessels passing over the spot are clear, healthy and unaffected; retina shows nothing abnormal and *no* scotoma can be found.

There are several spots of cholesterine, as before mentioned, but the active process has passed away.

Told to take internally kal. iodidum gr. viij. and strychn. sulph. gr. $\frac{1}{30}$ t. d. for six weeks or two months, and to see me should he have any trouble.

This case is interesting because of the astigmatism being present upon the first examination, and the pathological condition not being recognized, although examined carefully; but more particularly because the astigmatism increased gradually, —glasses always giving good vision—afterwards became less, and, finally, entirely passed away.

The fact of the astigmatism being myopic is also interesting; it would naturally be expected that it would be hypermetropic. It was probably dependent upon a disarrangement of the layer of rods and cones rather than an alteration in the form of the internal surface of the retina.

I regret that I did not try the refraction when under atropine, for it is possible that the astigmatism was hyperopic, and a spasm of accommodation converted it into a myopic one. My reason for not using atropine was that I feared the effect of light, deeming one of the causes of the trouble to have been the bright light caused by opening the furnace doors of the boilers which were under his care.

THE PRESCRIBING OF CYLINDRICAL LENSES.

BY EDWARD JACKSON, M. D.

Chief of the Eye Clinic in the Philadelphia Polyclinic

Cylindrical lenses can only correct what is known as regular astigmatism. With regular astigmatism there is always present some irregular astigmatism which we have no means of correcting. Bearing this in mind, the first principle governing the prescribing of cylindrical lenses is:

One cylindrical lens, of the proper strength, placed with its axis in the right direction, and with the proper spherical lens, will correct any case of astigmatism, in so far as it is capable of correction by cylindrical lenses.

This rests upon the laws which govern the action of cylindrical and sphero-cylindrical lenses, and is susceptible of rigid mathematical demonstration. It was clearly understood fifty years ago by the mathematician and astronomer Airy, when he ordered a sphero-cylindrical lens for the correction of his own compound myopic astigmatism.

When, in the use of trial-lenses, the patient seems to see better through a second cylinder with its axis placed obliquely, as compared with the axis of the cylinder already before the eye, it is simply to be taken as evidence, that the cylinder first selected was not of the proper strength, or its axis turned in the right direction, and perhaps that the right spherical lens had not been combined with it.

In reading the following paragraphs, bear in mind the distinction between meridian and axis, the latter being perpendicular to the plane of the former. The principal meridians of refraction are, for regular astigmatism, always perpendicular to one another. They are often spoken of as the principal meridians of the cornea, but this involves the unwarranted assumption that the total astigmatism is identical with the corneal astigmatism.

Having determined the degree of ametropia in each of the principal meridians of refraction, the proper correction is thus arrived at:

a. *Make the spherical plus or minus as the meridian of least ametropia requires a plus or minus correction.*

b. *Make the spherical just strong enough to correct the meridian of least ametropia.*

c. *Make the cylindrical plus or minus, as the meridian of greatest ametropia requires a plus or minus correction.*

d. *Make the refractive power of the cylindrical equal to the difference between the refractive powers of the principal meridians.*

e. *Place the cylindrical so that its axis corresponds with the axis of greatest ametropia, its meridian of greatest curvature corresponding to the meridian of greatest ametropia.*

For illustration take the following supposititious cases:

Compound hypermetropic astigmatism. In one principal meridian, at 90° (axis 180°), H = 1. D; in the other principal meridian, at 180° (axis 90°), H = 4.D. The correction for H is plus. Hence, (a) sign of spherical +; strength of spherical (b) =1. D, or the correction for the meridian of least ametropia. Sign of cylindrical (c) that of correction for greatest ametropia, +. Strength of cylindrical (d) = 4. — 1. = 3. D. Direction for the axis of cylindrical (e) that for the *axis* of greatest ametropia, that is 90°. Hence, the prescription + 1. Sph. ⌢ + 3. cy. axis 90°.

Simple hypermetropic astigmatism. Meridian of 90° (axis 180°) emmetropic or H = 0. Meridian of 180° (axis 90°) H = 3. The spherical becomes zero. Sign of cylindrical +; strength 3 — 0= 3; axis, that of greatest ametropia, 90°. Hence + 3 cy. axis 90°.

Mixed astimatism with predominant hypermetropia. Meridian of 90° (axis 180°) myopia =1. Meridian of 180° (axis 90° hypermetropia=2. The 90° meridian (180° axis) is of course that of least ametropia, and the 180° meridian (90° axis) that of greatest ametropia. Hence, spherical, sign (correction for M) minus, strength 1.D. Cylindrical, sign (correction for H) plus; strength, (the ametropia in the two meridians being of opposite kinds, one refracting 1.D too strongly, the other 2.D too weakly, the difference becomes the sum of these) 1 + 2 = 3; axis, that of greatest ametropia, 90°. Thus we get — 1 sph. ○ + 3 cy. axis 90°.

Mixed astigmatism with predominant myopia. Meridian of 90° (axis 180°) M = 2. Meridian 180° (axis 90°) H = 1. The 90° meridian being now most ametropic, the 180° meridian least ametropic, we have spherical sign +, strength 1, cylindrical sign — strength 2 + 1 = 3, and axis, that of greatest ametropia, or 180° = + 1 sph. ○ — 3 cy. axis 180°.

Simple myopic astigmatism. Meridian 90° (axis 180) M = 3. Meridian 180 (axis 90°) emmetropic, or M = 0. Here again the spherical becomes zero and we get — 3 cy. axis 180°.

Compound myopic astigmatism. Meridian 90°(axis 180°)M= 4. Meridian 180° (axis 90°) M = 1. Here we get by application of the rules, —1 sph. ○ — 3 cy. axis 180°.

Now each of the lenses as determined above has an optical equivalent in the shape of a sphero-cylindrical lens, and all except those for simple astigmatism have optical equivalents in crossed cylinders thus:

For + 1 s. ○ + 3 cy. ax. 90°, the equivalent is + 4 s ○ — 3 cy. ax. 180°; or, = + 1 cy. ax. 180° ○ + 4 cy. ax. 90.

For + 3 cy. axis 90°, the equivalent is + 3 s ○ — 3 cy. ax. 180°.

For — 1 s ○ + 3 cy. ax. 90°, the equivalent is + 2 s ○ —3 cy. ax. 180°; or, — 1 cy. ax. 180° ○ + 2 cy. ax. 90°.

For + 1 s ○ — 3 cy. ax. 180°, the equivalent is — 2 s ○ + 3 cy. ax. 90°; or, + 1 cy. ax. 90° ○ — 2 cy. ax. 180°.

For — 3 cy. axis 180°, the equivalent is — 3 ○ + 3 cy. axis 90°.

For — 1 s ○ — 3 cy. ax. 180°, the equivalent is—4 s ○ + 3 cy. ax 90°; or, — 1 cy. ax. 90° ○ — 4 cy. ax. 180.

These have been spoken of as exact optical equivalents, and so they would be if we were dealing with lenses infinitely thin, and absolutely free from aberration. But as a matter of fact we have to employ lenses of appreciable thickness and exhibiting the defects of aberration, both chromatic and so-called spherical, which equally affects cylinders whose normal section is a circle.

When the spherical correction is ground on one side of the glass and the cylindrical correction on the other, there occurs distortion and narrowing in one direction of the field of the lens, which is greater for crossed cylinders than sphero-cylinders, and increases with the thickness of the glass. Aberrations increase with the curvature of the surfaces, as does also the necessary thickness of the glass. A careful study of the matter will show, that the above rule always guides to the selection of the sphero-cylinder having surfaces of the least curvature, and therefore being the least affected by aberration and distortion of the field. Moreover, the glass so selected is the lightest, and is most readily ground with accuracy, and therefore the cheapest. On all accounts it is the best. In the January number of this Journal (p. 14), Dr. H. Culbertson has urged the use of negative cylinders for distant, and positive cylinders for near vision. He says: "That we have a choice of cylinders in the correction of ametropia, is well known, Thus in a given case of C O. H. A. = + D 1.0 s. ○ = D 0.5, axis (?) 180°, we may employ + D 1.5 s. ○ — D 0.5 cy. axis 180°; or, + D 1.5 s. ○ + 0.5 cy. ax. 90°."

That we have a choice among two or three equivalents, has been indicated; and the rule given to guide us in making the choice. By it is chosen the best combination for vision at any distance. Dr. C. finds one of the combinations to answer better for distance, and the other for near, simply because his combinations are not optical equivalents; + 1.5 s. ○ — 0.5 cy. axis 180° is not the equivalent of + 1.5 s. ○ + 0.5 cy. ax. 90°. The latter has, in every meridian, 0.5 D. more of refractive power than the former. If the former corrects the ametropia, the latter over-corrects it. If the latter is the proper correction, the former is insufficient. Of course the patient rejects an over-correction for distant vision, while for near he sees better with it. In such a case, he chooses the combination of lesser refractive powers for distant vision, not because it happens to be unscientifically arranged with a concave cylinder, but because it is the weaker lens; and he takes the other for near, not because it has a convex cylinder, but because it makes a stronger lens. Had real equivalents been compared as, + 1.5 s. ○ — 0.5 cy. axis 180°, with + 1. s. ○ + 0.5 cy. axis 90°; with glasses so weak as these most patients would notice no difference. Still we know that the latter, chosen by the rule, is slightly better, because thinner and less affected by aberration. The same criticism applies to the other cases supposed to illustrate these different applications for positive and negative cylindrics in the "*correction of ametropia.*"

Of course we are constantly ordering lenses which but partially correct, or over-correct the ametropia present. But this is done for a special purpose, not with any idea that it is the correcting lens that is being ordered.

For instance in the case of simple myopic astigmatism; suppose the patient's accommodation lost, and that he wants a glass to read with at 13 inches. The myopic meridian now has the proper refractive power, while for this purpose the emmetropic meridian requires + 3. D. Taking the rule; and for correction substituting required change of refractive power; and for ametropia the difference between existent and desired refractive power, we find 90° meridian (180° axis has the proper refractive power; 180° meridian (90° axis) requires 3. D. added to refractive power. Spherical zero. Cylindrical sign +, for, in axis of greatest required change, refractive power must be added, strength 3—0=3. Axis that of greatest required change, 90°; hence:

For near work, + 3 cy., axis 90°.

TRANSLATION.

The following extracts from an article, *The etiology of cataract. Juvenile cataracts in workingmen employed in glass factories. By D. Meyerhoefer. Zehender's Monstabl. f. Augenhlk. Februar* 1886, seem to be of especial interest, as the observations of Dr. Meyerhoefer throw a great deal of light on the etiology of certain forms of cataract. After having stated that he had within two years, seen four juvenile individuals with cataract, all of whom were employed in glass factories, and that this gave him the idea, that this was more than an accidental occurrence, he says:

* * * The results of my examination of 506 individuals employed in glass factories are worthy of consideration to the highest degree.

Of these 506 men 134 were less than 20 years of age, 212 were between 20 and 30, 96 between 30 and 40, 45 between 40 and 50, 16 between 50 and 60, 2 between 60 and 70 and 1 was more than 80 years of age. The youngest was 15, the oldest 81 years old.

My examinations show in the most startling manner, how correct was the assumption, which prompted me to make them, as I found dimness of the crystalline lens in fifty-nine individuals, i. e., in 11. 6 per cent. of all the cases.

This result is certainly a startling one, and is the more so when we consider the comparative age of the individuals affected, since we find a remarkable excess of the juvenile cataracts.

Considering the difficulty in giving a distinct limit for what we may call a juvenile cataract, I think we may put under that head all cataracts before the 40th year of life is reached. We then find that among 442 workingmen under 40 years forty-two individuals, i. e. 9. 5 per cent. showed premature dimness of the lens. Of these six were under 20 years, twenty between 20 and 30 years, and sixteen between 30 and 40 years old.

Of the sixty-four workingmen who were older than 40 years 17, i. e. 26. 5 per cent., showed a dimness of the lens. * * *

* * * From the foregoing tabulated statement it is plain that the juvenile cataracts I found among the glass-makers showed the same characteristic forms, as do juvenile cataracts in other individuals. The one point only cannot help being noticed, namely, that *the left eye* was found to be affected much more frequently than the right.

I should, furthermore, state here that in the affected individuals no diseases of the fundus (which might have accompanied or caused the formation of the cataract) could be found with the ophthalmoscope.

The frequency of the occurrence of cataract among the glass-makers can hardly be considered to be accidental. On the contrary, we are forced to assume most decidedly that there must exist a common cause. The question is now, of what nature is this cause. * * *

* * * In only eight of the cases have I been able to apply the sugar test. * * * In these cases no trace of sugar was found in the urine. * * *

* * * It, therefore, only remains to assume that noxious influences which especially lead to the formation of premature cataract, are inherent to the manufacture of glass. Every one, who has had an opportunity to become acquainted with the character of this work, can easily comprehend that glass is manufactured under such circumstances, that the organism of the workingmen employed near the fire (and those alone are here under consideration) must be influenced in a grave manner. * * *

* * * The men usually begin the work as glass-makers when 16 years old, and from that day forth their only occupation is with the hot, fluid mass in the immediate neighborhood of the melting-furnace. They work from ten to twelve hours daily and without interruption until the furnace needs repair and the fire must be extinguished. Thus the work is kept up without a day's rest, Sundays and week-days, for from forty to forty-five weeks; then they have a rest, which usually lasts for about eight weeks.

The temperature in which these glass-makers have to stay for half a day is really "infernal." The thermometer at the distance at which the workman has to keep his face, especially its left half, towards the open fire (though for a short period only each time when he dips out the glass, but at short intervals and very often), showed after about ten minutes a temperature of 65° Celsius.

Most of the glass-makers show the effects of this enormous heat plainly in their faces. The heat usually causes the skin of the face to be burned slightly, and this is shown by a reddish-brown color of the skin: in some cases even the skin is dry and like leather. In some glass-makers the heat will cause inflammatory processes which lie deeper in the tissue of the skin and which result in the formation of scars. In one case this formation of scar-tissue had caused ectropium of the lower lid on the left side. This case showed very plainly the intensity of the heat in which the glass-makers.have to work. Besides the scar-tissue in the skin of the cheek and the resulting ectropium, there existed on both corneæ whitish, cicatricial formations which could only be due to former losses of substance. Neither the patient nor his mother knew anything of a former inflammatory process and even emphatically denied its former occurrence, yet, these scars of the cornea could only be explained as consequences of the work near the fire, as a kind of drying up and burning of the superficial layers of the cornea.

The second result of the enormous heat in which the glass-makers are at work is the excessive increase of their transpiration. This is so great that the sweat actually runs from them. They do, of course, not get accustomed to this, since the transpiration is the necessary correcting agent against the terrible heat, and without it the surface of the workman's body would finally have to be burned. * * *

* * * I want here to state that the earnings of glass-makers are unusually high, and that in this way they are enabled to take the nourishment which is adapted to their work. Their looks, therefore, are not in the least unhealthy. * * * The premature formation of cataract among them is then not due to marasmus.

In these two factors, namely, the *enormous heat* of the open furnace and the *profuse secretion of sweat* due to it, by which the trade of the glass-workers is distinguished from others, we must seek the combined causes or in one of the two *the* cause of the premature formation of cataract in these workmen. * * * * * * The exclusive causation was not to be seen in the enormous heat alone, since besides nineteen cases of cataract in both eyes, in seven cases the *right* eye alone was the affected one. [Dr. Meyerhoefer does not seem to have taken into consideration that this might be explained by the fact that these latter seven workmen were, perhaps, left-handed, which would explain the discrepancy.—EDITOR.]

Another explanation being wanting, I was forced to accept as a second cause,and one which, perhaps, would help at the same time and to a higher degree in the formation of the premature cataract, the other factor, which may be considered as characteristic of the glass-makers work; namely the continuous hypersecretions of sweat, the continued loss of water to which the body is subjected during their work.

It is just on this point that it seems to me my observations call for more than a simply casuistic interest, since they may be apt to answer the hitherto open question as to the formation of the *diabetic cataract.*

Such a comparison between the glass-maker's and the diabetic cataract seems to me to be obvious, the *tertium comparationis* being the enormous and continued loss of water.

It will probably have the same effect, whether a diabetic patient loses an excessive amount of water through polyuria, or a glass-maker loses it through the excessive secretion of sweat, the effect being a loss of water, a drying up, so to speak, of all the tissues of the body. That such a loss of water can cause the formation of cataract is proven by the experiments of Kunde and his successors. * * *

CORRESPONDENCE.

DUNKIRK, N. Y., FEB. 27, 1886.

Mr. Editor:—I read with interest but with regret Dr. Coggin's letter advocating the adoption of a 36 inch lens as the standard equivalent of one dioptre, and making the remarkable statement "that a + 36 American lens is nearer the standard dioptre (37 French inches) than is a + 40."

As I understand the matter, a + 1 D is a lens whose principal focus (i. e. focus for parallel rays) is equal to one metre; now one metre is equal to 36.94 + French inches and to 39. 37 + English or American inches. Hence Dr. Coggin's statmement is just the reverse of the facts, and the correct statement is "that a + 40 American lens is nearer to the standard dioptre (37 French inches) than is a + 36", and is indeed a very close approximation.

A + 36 *French* is indeed nearer to the standard dioptre than + 40 French, providing the French numbering refers to the focal power of the lens; but as the old numbering of lenses was based, not on the focal power but on their radii of curvature, and it was merely a happy chance that the radius of curvature corresponded very closely with the focal length when the lens was double and equally convex and the glass of which it was made had an index of refraction of 1.5. under such a system two lenses might be numbered alike, and correctly so, and yet being made of different qualities of glass with different indices of refraction would differ in power. In practice this will often be found to be the case, spectacles of the same number, especially among the cheaper imported goods, varying considerably in power.

It is to be hoped that the dioptric system will soon be adopted in entirety, and spectacle lenses ground upon it. Then a + 1 D will have a focal length of one metre equal to 39.37 + American inches, and till then we had better adopt for our approximation, 40 American inches, which varies from the correct amount by less than two per cent., than 36 which is very nearly ten per cent. out of the way.

36 has the advantage over 40 in being a greater common multiple, but is widely erroneous while 40, which is a sufficiently great common multiple for all practical purposes, is so nearly correct, that the error resulting from its adoption is absolutely of no practical importance. Yours respectfully,

Geo. E. Blackham.

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RETINITIS PIGMENTOSA.

DR. S. C. AYRES, CINCINNATI.

This report of twenty-five cases of retinitis pigmentosa represents nineteen families. There were eighteen males and seven females which make the percentage of females twenty-eight per cent, which is about what is usually reported. The parents were related in twenty per cent, and were not related in twenty-four per cent. In fifty-six per cent no record of relationship is noted.

In two cases, eight per cent, mothers are known to have suffered from the same disease. Excluding the first and fourth families, where all the members were examined, there are eight families where the other children have ocular defects of some kind, but what it is not possible to state. It is presumably from the same disease, judging from the description given. In five families the records do not state the condition of the other members. In four cases, sixteen per cent, glaucoma occurred; in two of them in both eyes. In two cases, eight per cent, there were opacities of the posterior lens capsule. The history of the first three cases is remarkable as showing a tendency to glaucoma.

L. P. H., æt. 37, has had defective vision since he was eighteen years of age. He cannot venture out alone at night for fear of falling, and he is not able to distinguish a moonlight night from a cloudy one. Even by daylight he has difficulty in walking and

and is in danger of running against vehicles at the street crossings. June 25, '75, V. = $\frac{15}{\text{xxx}}$ with either eye, and reads Sn. $1\frac{1}{2}$ r. e. at 10″ and Sn. 1 l. e. at 10″. Field of vision very much contracted. At 24″ it measured 8″ vert. × 8″ horizontal. He was examined in 1871 but since then his vision has not perceptibly failed. He is partially deaf. The retinæ are moderately pigmented. The blood vessels are diminished in calibre and the papillæ are a shade whiter than normal. In 1876 and '77 he was again examined, and his vision for the distance found to be slightly less than in '75. His central vision was still quite good.

Jan. 16, 1886, he writes. "It seems to me that recently my vision has been declining more rapidly in proportion than that of my sister and brother, considering that I have the use of both eyes while they have but one each. Objects are getting more indistinct and shrouded in mist, and reading is much more difficult."

Case II. E. H., 35, sister of above. Eyes similarly affected, and the failure in sight was noticed about the same age. The right eye is glaucomatous and painful at times, and vision is reduced to bare perception of light. In the left eye the field of vision is markedly contracted, but the central vision is good and she can read ordinary print without trouble. She says her vision is steadily failing year by year. May, '75. V. = $\frac{20}{80}$ with $-\frac{1}{8}$. A year later in 1876, V. = $\frac{20}{80}$ with $-\frac{1}{7}$. Vision was the same but her myopia had increased.

In Sept. 1878. She had an attack of acute glaucoma of the left eye. She suffered severe pain and vision was very much impaired. I went to Columbus and with the assistance of Dr. Starling Loving made an irridectomy upward, which had the effect to arrest the glaucoma. I saw her a year or two later, and she still had vision enough to enable her to go around comfortably and read ordinary print.

In her case the retina was more pigmented than in her older brothers, and there was decided atrophy of the papilla and diminution in the calibre of the vessels. When I saw her last in 1880 the disk was white and all of the retinal vessels had disappeared except two small branches, one going upward and one downward. The appearance was remarkable, taking into consideration the fact that she still had a moderate amount of vision.

Like her brother she is quite deaf and has to be spoken to in a loud tone. At the present time, Jan. 1886, she is still able to read, but with some difficulty.

Case III.—G. W. H., 33, brother of the above, is a tall spare man, rather delicate in appearance, but enjoys good, if not robust health. He has vertigo occasionally, especially if he rises suddenly. He is unable to walk alone at night on the street, and even has difficulty in passing persons by daylight. His eyes have been defective since boyhood, but for several years have remained stationary. Sept., '74, V. = $\frac{15}{\text{C}}$ with either eye, and reads Sn. 4 at 10." Field of vision concentrically contracted. Examined again April, '75, V. = $\frac{15}{\text{LXX}}$, and reads Sn. 2 slowly at 6." Vision at this time is better than at the previous examination. This may have been owing to the difference of the light.

In April, '76, he had an attack of acute glaucoma in both eyes. Vision in left eye was reduced to seeing shadows of the hand downward and inward. With the right eye he could still read Sn. 4. Dr. Williams made an iridectomy in each eye upward, with the result of checking the glaucoma and saving a useful amount of vision. A month later he could read Sn. 2 at 4" r. e., but the left eye was not improved. Five months later vision was slightly better l. e. but r. e. unchanged. He still retains moderate vision in the left eye.

Family history. Parents are living and in good health. The father has perfect sight for distant as well as near objects. The ophthalmoscope shows no pigment degeneration of the retina. The mother is myopic about 6 D. Her vision is very good with the proper correcting glasses. I could detect no pigmentation of the retina. There were five children in the family. The eyes of the first three are described above. The fourth child died at the age of sixteen, and up to that time there was no appreciable failure of vision. The fifth, now a young lady of 26, was examined ophthalmoscopically and no retinal defect found. Her vision was perfect in both eyes. In the three cases reported above, vision began to fail at about the age of eighteen. The parents were not even remotely related.

Case IV.—G. B., 41, glaucoma absolutum, left eye T + 3, cornea hazy. Eye has been blind and painful for a year. It was enucleated, and upon examination the retina was found to be strongly pigmented. The pigmentation extended from the periphery almost to the disk.

The right eye also presents the characteristic retinal pigmentation. Hm. $\frac{1}{10}$ V. = $\frac{15}{L}$ Sept., 1875.

The *H* was corrected and the eye gave him no trouble until March 7, 1883, when he was seized about 9 o'clock with excruciating pain in the eye. An examination the next morning revealed the fact that he was suffering from an attack of glaucoma fulminans. Vision was entirely abolished, the pupil was widely dilated and the pain intense. A liberal iridectomy upward was made at once by Dr. Sattler. The result of the operation was relief from the pain and a restoration of a very moderate amount of vision. He has three brothers and five sisters of whom one sister does not see well, but whether from the same cause is not known. His own children all have good eyes, with no evidences of retinal pigmentation.

Case V. E. G. P. 54 has had night blindness for twenty years. He is a carriage painter by trade. His field of vision is very much contracted. For a few years past this symptom has steadily increased and he often stumbles over objects in the shop. The pigmentation is well marked. In Jan. 1881, he had an attack of glaucoma of the right eye with intense pain. At present the pupil is moderately dilated. T. + 2 and V. = perception of light. In the left eye his vision = $\frac{6}{64}$ and he reads Sn 15 slowly.

Case VI. Mrs. C. C. æt 47. Sister has retinitis pigmentosa, but the pigment is very sparsely scattered over the retina. V. = $\frac{15}{30}$ r. e. and $\frac{15}{25}$ l. e. No apparent limitation in the field of vision.

They have a younger sister with defective eyes but cause is unknown.

The maternal grandmother had night blindness.

Case VII. Mrs. E. R. O., æt. 37, widow, gives the following history. She states that since she was a child she could not see well at night. Does plain sewing for a living, and does not experience much difficulty in the use of her eyes.

S. P. V. = $\frac{15}{25}$ and reads Sn 2 at 12″ with either eye. There is a small opacity in the posterior pole of each lens. The veins are considerably diminished in size in both eyes.

The pigment is sparsely scattered over the retina, the greater portion being on the inner half.

She is the third child in a family of five children, and her parents were neither mediately nor remotely related.

Case VIII. A. R. æt. 15, daughter of above, has eyes similarly affected. She has some difficulty in walking at night but can sew or read without difficulty. V. = $\frac{15}{20}$ with either eye and reads 1 Sn at 12″, vessels slightly diminished in size. She has less pigment than her mother.

Case IX. K. R. æt. 12, sister of above, has more pigment in the retina than either her sister or mother. V. is only $\frac{15}{50}$ and reads Sn one with difficulty but Sn 2 readily. Has some difficulty in walking and more in reading at night.

Case X. P. N., æt. 64, has glaucoma of the right eye, with the lens dislocated into the anterior chamber, as the result of an injury received fifteen years ago. Has seen tolerably well with the left eye until recently, when it began to fail. The ophthalmoscope revealed that he had incipient cataract, but through the striæ of the lenticular apacity could be seen the pigmentation of the retina. Has had night blindness since boyhood.

Case XI. S. N., æt. 61, brother of above, has had night blindness since youth. He also has incipient cataract, but the pigmentation of the retina could be distinctly seen through the striæ in the lenses.

Case XII. A. W. F., æt. 25, characteristic retinal pigmentation and F. very much contracted. Sight so imperfect that he is unfit for any ordinary work.

Family history.—Parents cousins, and mother in delicate health. He has three brothers and three sisters. All of his brother have such defective eyes that they cannot see to "plow a field or drive a reaper." One of his sisters has bad eyes, but the other two enjoy good sight. In the order in which they came the first and fifth child had good and all the rest imperfect eyes.

Case XIII. L. M., æt. 31. Patient remembers that at ten years of age his vision was imperfect, as he could not see as other boys did. He went to school and learned to read, but his sight failed so rapidly that at the age of seventeen he was no longer able to see sufficiently to read. Since that time vision has gradually declined, and is now practically nil. He has barely perception of light in l. e. and r. e. v. = 0.

He has marked pigmentary changes in both retinæ, extending to the papilla in r. e. and almost to it in l. e. White atrophy of both papillæ; blood vessels very much reduced in size, and some of them obliterated.

Case XIV.—C. L., æt. 26, has noticed a gradual impairment of vision for some years. About seven years ago she was able to read newspaper print comfortably, but now only reads 8 Sn. at 10″.

Retinal pigment degeneration is very strongly marked, and extends beyond the equator of the eye.

Family history.—First and second children have good eyes; third, fourth and fifth defective eyes; sixth, seventh and eighth sound eyes. Patient is third child. Parents were cousins. Mother has good eyes, but father's sight very defective. She says he could not see to get about. F. contracted to about 8″ hor., by 9″ vert. at 24″.

Case XV.—M. V., æt. 12, retinitis pigmentosa in both eyes. $V = \frac{15}{LXIV}$ r, and $\frac{15}{XX}$ l. He is one of a family of ten children, three of whom have imperfect eyes. There is a history of remote consanguinity on the part of his grand parents.

Case XVI.—P. D., æt. 40, characteristic pigmentation of the retina in both eyes. F. contracted in both eyes, but vision for distance moderately good. The pigment is sparsely scattered in the retina. Failure in vision began about fourteen years ago. He is the youngest of seven children and has one brother with defective eyes. His mother has had imperfect sight for the past thirty years and is now almost blind.

Case XVII.—C. W. C., æt. 23, has well marked retinitis pigmentosa. Says his sight has been failing since he was 7 years of age. F. very much contracted, but is still able to read. Sn. $1\frac{1}{2}$ at 12″. Decided atrophy of papillæ. Parents not related.

Case XVIII.—Miss C. B., æt. 30, has had failing sight for five years past, and vision is now reduced to quantitive perception of light. The pigmentation is abundant and there is marked atrophy of the disk and diminution of the calibre of blood-vessels. She is one of a large family of children, the balance of whom have good eyes. The parents have good eyes.

Case XIX.—H. D., æt. 17, is so amblyopic from retinitis pigmentosa that it is with difficulty that he can walk alone. He is the second in a family of four children and is the only one with imperfect eyes. In addition to examining the children I examined the parents and found their eyes free from disease of any kind.

Case XX.—S. C. V., æt. 44, has retinitis pigmentosa of both eyes with a small opacity on the posterior capsule of each lens. He is the fifth child in a family of nine children. Three children, the first, fifth and seventh, have defective vision. His father and mother were first cousins. He has an uncle and aunt who are first cousins, who have two children. One of them has defective sight, but he cannot tell how much it is impaired nor does he know the cause.

Case XXI.—W. G., æt. 38, has well marked pigmentation of the retina. His visual fields are markedly contracted. Says he had trouble while in the army seeing at night. Vision has very much diminished in the last three years, and he cannot see to walk alone. A sister who accompanied him had sound eyes.

Case XXII.—J. S., æt. 58, well marked retinitis pigmentosa in both eyes. V. $=\frac{6}{120}$ with either eye. Pigment very abundant. During the Mexican war first noticed that he could not see at night. His central vision, however, remained good enough to work at his trade (shoemaker) until three months ago, when it failed suddenly. Arteries small and discs pale.

Case XXIII.—W. A. S., æt. 44, marked retinitis pigmentosa. Typical pigment infiltration. He was first examined in 1873, when V. = 0.75 with either eye. Family history.—Parents not related. His mother died at 66, and was blind for several years before her death with the same disease. His maternal grandmother is still living (1885), at the age of 89, and has been blind for many years. He says that the great-grandmother and one or two of her brothers were blind, presumably with the same disease. One of his mother's sisters and one brother are nearly blind. Two of her sisters have good eyes. He has only one sister, and her eyes are free from disease of any kind. His second examination was in October, 1883, when vision was 0.2 r and 0.1+l. In October, 1885, he was examined again, and then vision was 0.3 r. and 0.1—l. The right eye seemed slightly better and the left eye slightly worse than they were two years before. His field of vision was reduced to the point of fixation. The pigment extended down to the disk.

Case XXIV.—T. J. R., æt. 33, characteristic retinitis pigmentosa, with greatly impaired vision.

Family history.—There are ten children in the family, seven girls and three boys. Four of the girls and two of the boys have ocular defects, presumably the same as those of the patient, who is the oldest of the family.

Case XXV.—W. H. R., aet. 25. Retinitis pigmentosa, with vision so much impaired that he only counts fingers at 7′ with either eye. No family history recorded.

Family.	Male.	Female.	Parents related?	Parents' eyes.	Children's eyes.	Glaucoma.	Post cortical opacities.	Remarks.
1.	2.	1.	No.	Mother very myopic.	Only one sister had perfect eyes.	Occurred in two of the three cases.		
1.	1.		Not stated,	Not noted.	Three brothers with good eyes Five sisters, one has defective eyes.	Both eyes.		His own children have sound eyes.
1.	1.	1.	Not stated.	Not noted.	No other children in family.	Glaucoma right eye.		Paternal grandmother had night blindness.
1.		3.		Mother's eyes affected.	Two daughters with retinitis pigmentosa		Post cortical opacities.	Father is dead; had good eyes.
1.	2.							Senile cataract in both cases.
1.	1.			Cousins.	Three brothers and one sister with defective eyes. Two sisters with sound eyes.			
1.	1.		Not stated.					
1.		1.	Cousins.	Father imperfect eye.	Eight children, three of them with defective eyes.			
1.	1.		Remotely related.		Ten children in family three of whom have imperfect eyes.			
1.	1.		Not stated.	Mother blind.	One brother with defective eyes.			

Family.	*Male.*	*Female.*	*Parents related?*	*Parents' eyes.*	*Children's eyes.*	*Glaucoma.*	*Post cortical opacities.*	*Remarks.*
1.	1.		No.					
1.		1.	Not stated.	Good.	Large family, all others with good eyes.			
1.	1.		No.	Good.	Four children, only one with diseased eyes.			
1.	1.		Cousins.		Nine children, three of whom have ocular trouble.		Post cortical opacities.	
1.	1.		Not stated.		One sister with good eyes.			
1.	1.		Not stated.					
1.	1.		No.	Mother had retinitis pigmentosa; also maternal grandmother and great-grandmother.	One sister with sound eyes.			
1.	1.		Not stated.		Seven girls and three boys. Four girls and two boys have ocular defects.			
1.	1.		Cousins.					
19.	18.	7.						

THE MECHANISM OF ACCOMMODATION AND A MODEL FOR ITS DEMONSTRATION.

B. ALEX. RANDALL, A. M., M. D.

In the January issue of the AMERICAN JOURNAL OF OPHTHALMOLOGY, Dr. Furney discusses this subject and urges the necessity of a new theory, because the older ones are incompetent to explain the facts. As his statement of these facts and of the Helmholtz theory is incorrect in several important particulars, it seems not out of place to venture a few words on this much discussed topic.

Passing over his first "fact" that accommodation is voluntary, to the strict accuracy of which exception might be taken, we learn from his third premise that *only the anterior curvature* of the lens varies in changes of the accommodation. Donders[1], Helmholtz[2], Knapp[3], Woinow[4], and others show the contrary, while holding that the *position of the posterior pole* remains unchanged; this being the result obtained by Cramer, although not conclusively proven by him. As to the correct theory of the accommodative mechanism, if, as would seem, that of Helmholtz is meant, this is far from accurately set forth in the statement, "the capsule of the lens is supposed to be varied in size, forcing the contents into a more or less spherical shape as its area is reduced by allowing it to contract upon itself, or its area is increased or extended by stretching." Although most authorities agree that the lens capsule is elastic, I know of none who ascribe to it any such elasticity as is above implied: on the contrary the essence of the Helmholtz theory is that this capsule is practically inelastic [That this is not a correct statement is proven by O. Becker, Graefe and Saemisch, Vol. 5, and by the editor's paper on healing after iridectomy, Knapp's Archive, Vol. 4, page 423 to 444. —EDITOR.] and of unchanging area. The geometrical property of

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1. Donders, *Accom.*, *etc.*, p. 15. 2. Helmholtz, *Phys. Optik.*, p. 122.
3. Knapp, A. f. O., vi., 2. 4. Woinow, *Ophthalmometrie*, p. 119.

the sphere, that it has the greatest possible volume for a *given area* of surface, then fully explains the tendency of the very elastic lens fibres to give to that body a form approaching the sphere, when released from tension upon its equator. However, as Dr. Furney assumes this constant area of the capsule as an essential of his theory, further discussion of it may be omitted. The action of the ciliary muscle as a "tensor choroideæ" Dr. Furney seems to regard as wholly hypothetical, in spite of the proofs of Vœlckers and Hensen, and the corroborative evidence of studies of the ciliary-body and the lens-margin in the living human eye, and he seems unaware of the "accommodative phosphene" of Czermack. To assume that a contraction of the ciliary muscles must alter the curvature ot the cornea is as wholly gratuitons as to claim a similar effect from the action of the external muscles or any one of them; or to assert that they must draw forward the bony bottom of the orbit in their contraction. The *pull* upon origin and insertion must in any such case be equal; but the *effect* depends entirely upon the relative fixity of the two points. We know that the choroidal insertion of the ciliary muscle moves and the choroid is drawn forward; while the most rigid scrutiny fails to detect any movement of the corneal margin,[1] unless a small portion of it is cut loose from all but its attachments, when it is drawn visibly inward by the contraction of the ciliary muscle.[2] Analogy also furnishes us with the fact that in birds and some other animals, where the strain upon the origin of the ciliary muscle is probably greater, all danger of corneal yielding is relieved by a reinforcement of the limbus by a bony ring. How far the drawing forward of the choroid and of the retina tends to compress the retina and vitreous, is a question that has received little attention. Full compensation is probably made by the change in the equator of the lens. Possibly this pressure is a partial explanation of the accommodative phosphene.

The observed facts, and the Helmholtz theory of the accommodative mechanism have been too often clearly set forth to need

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1. Helmholtz, *Phys. Optik.*, p. 112.
2. Hensen and Vœlckers, *Ueber die Mech. d. Accom.*, p. 25,

any detailed explanation here,[1] but a description of a simple working model, which I have used for its demonstration may not be amiss, since it furnishes a fair, if not complete, proof.[2]

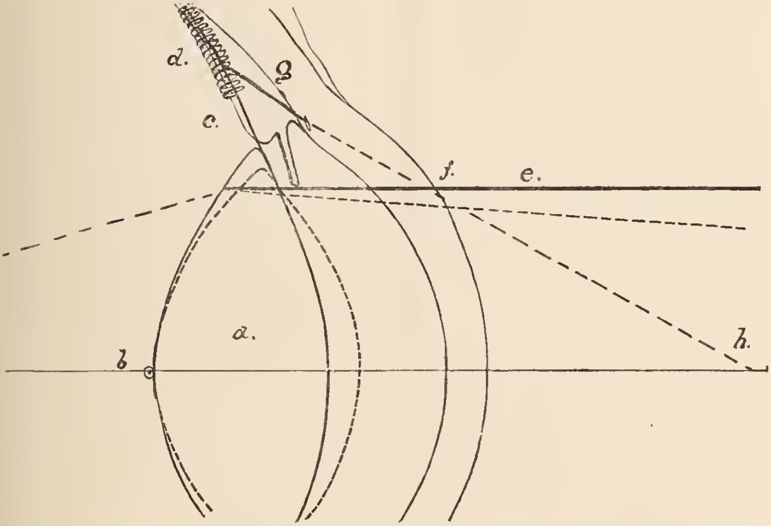

FIG. 14.

The outline of the crystalline lens in section is represented by a properly bent metal spring (a), the posterior pole (b) being fastened by a pivot to the foundation board of the model, on which the eye is sketched in outline. While tension is exercised upon its equator through the “suspensory ligaments” (c) by spiral springs (d). Rods (e) are fastened to the posteriar curve of the lens near the periphery to represent the rays of light for which the lens is adjusted. (These can be bent at (f), if desired, to represent the *corneal refraction.*) Cords (g) are attached to the spiral springs, and passing through the region of Schlemm's canal, converge on the back of the model to unite at (h). The rods (e) have a primary parallelism in the position of rest, and the eye then represents the emmetropic eye adjusted for dis-

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1. Vide among others the writer's article in the Louisville *Med. Herald* Dec. 1880, p. 364.

2. A similar model has, I believe, been devised by Dr. Lucien Howe.

tance. Traction upon the cords (g) in the direction of the action of the ciliary muscle, relaxes the tension exercised by the spiral springs upon the zonula, the lens contour becomes more nearly circular, and the rods (e) converge and indicate the p.p. for which the eye is accommodating. The rigidity of a metal spring precludes a perfect representation of the delicate, flexible tissue of the eye, and limits the amplitude of the changes; but these none the less approximate to the actual variations as observed in the human eye, and this without the exaggeration of any of the elements of the problem, except for convenience, the unusual width of the pupil (8 mm, in the diagram, which is drawn to scale from the data of v. Jaeger and Knapp.)

It were needless to discuss the imcompetency of the *new* theory of the accommodation, even had it anatomical or physiological basis. Like the theory of active participation of the lens itself in accommodation, it had best begin by explaining why the lens is more convex after death than ever in life, why the vital "voluntary" act of accommodation is most vigorous in the dead eye.

THE PROLATE LENS OF DR. FOX.—MR. BORSCH'S SPHERO-CYLINDERS ON ONE SURFACE.

BY DUDLEY S. REYNOLDS, M. D., LOUISVILLE KY.

I confess to have read the first announcement of the form of the prolate lens described by Dr. Fox with some degree of incredulity. I have observed with increasing interest the various opinions expressed by gentlemen who had no facts upon which to base their criticisms. Dr. Fox did not claim to have observed the ordinary practice of directing his optician to construct a lens for the defect in his patient's eye. The demonstration of irregular astigmatism in an aphakial eye was of itself unusual. All the criticisms I have seen upon Dr. Fox's case have been confined to the presumed error of the major premise. To satisfy myself, I wrote some time ago asking Dr. Fox for a duplicate of his bi-cylindro-spherical lens for measurement. Shortly afterward I received from Mr. Borsch, the optician, a series of very remarkable lenses along with the now famous + 10 D s ⌣+ 3 D c 180° ⌣+ 2 D c 50° (ground in one.) I placed this glass in the clamp of my improved Snellen's phakometer, and registered indistinctly $+\frac{1}{2,\,1\text{-}2}$ 150° $+\frac{1}{3}$ 35° $+\frac{1}{3,\,1\text{-}2}$ 60°; or + 11 D 60° + 15 D 35° + 16 D 150°. The lines near their point of intersection on my registering disc cast halos upon the disc of the instrument. At a point corresponding very nearly with $+\frac{1}{3}$ sharp lines with halos surrounding in the two different meridians, separated at about 90°, appeared in the center. I then took $+\frac{1}{3,\,1\text{-}2}$ s ⌣ $+\frac{1}{11}$ c 50° and obtained perfectly clear lines. I was able to obtain clear, sharp lines in this combination, which measured $+\frac{1}{2,\,3\text{-}4}$ 140° $+\frac{1}{3,\,1\text{-}2}$ 50°. No intermedial focal point could be established. It was manifestly clear, the lens of Dr. Fox was not, therefore, a simple sphero-cylinder. Placing a stenopæic disc in contact with the surface of Dr. Fox's lens in the clamp of my phakometer, and revolving the disc upon the surface of the lens until the lines on the registering disc of the phakometer became clear, I developed precisely the refraction represented by the figures in Dr. Fox's formula. Except that, I found one axis 35°; one 150°; and one 60°. I use the characters of the English scale in stating my first measurement of this lens, to harmonize the statement with the language of some of those who have made criticisms upon the subject, and who may not enjoy the advantage of lenses graded in this and the metrical systems.[1]

In the series of lenses sent by Mr. Borsch for my examination, is one with a perfectly plain surface, which measures + 12 D Γ + 10 D. Another ground upon one side only, the other being perfectly plain, measures + 6 D Γ + 2.50 D. Others vary, with concave sphero-cylinders ground upon one surface, sphero-cylinders ground upon one surface, the other surface being concave, to give periscopic form to the lens. One is a prism 10° ⌒ + 3 D Γ + 6 D. Plain periscopic cylinders, both plus and minus, are also supplied, constituting altogether a very remarkable departure from the ordinary methods of constructing lenses. The pendulum motion mentioned by Dr. Fox, must cut two surfaces of different radii, corresponding to the meridian of the axis of motion, and at right angles to this meridian, thus producing a bi-cylindrical surface. If on the other surface a sphere is ground, the axis of the cylinders will remain the same, but the character of the spherical surface opposite will modify their relations in the combination. Take a segment of a sphere two inches in diameter and set it on a pendulum an inch and a quarter long, this pendulum being set in motion would cut a curve in the direction of its motion representing the segment of a sphere two and a half inches in diameter. At right angles to the axis of motion the curve would remain precisely the same as that of the sphere represented by the cutting surface at the distal end of the pendulum. Without going into the details of the mechanism by which Mr. Borsch was able to execute the order of Dr. Fox for the bi-cylindro-spherical lens, the fact remains just as Dr. Fox stated it, except as to the axes of his bi-cylinders, as my measurements clearly demonstrate. For genuine novelty of

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I use a set of lenses ground to order and graded by the English system, and a set of Nachet.

device, both Dr. Webster Fox and his optician, Mr. Borsch, are to be equally congratulated. From the tenor of Dr. Fox's letter to me, I infer he has directed samples of various forms of these new candidates for places in the trial cases of ophthalmic practitioners, sent to others for measurement. It is to be hoped that full reports of these measurements will be made public, for the purpose of definitely settling the various questions in dispute. I am especially happy in being able to state that the novelty of Dr. Fox's device has in no wise been impaired by the hasty criticisms of very many masters in ophthalmic science.

KERATO-IRIDO-DESCEMETITIS.

BY J. OSCROFT TANSLEY, M. D.,
Assistant Surgeon Manhattan Eye and Ear Hospital, New York City.

J. H., Norwegian, æt. 51 years; occupation, bookkeeper; residence, city. Was led into my office Dec. 15, 1881, and gave the following history: He had been troubled for about a year with asthma, and went, by advice, to the Adirondack Mountains early last summer. Never had any affection of the eyes before that November previous. While in the mountains his eyes began to annoy him by the sight being misty in the mornings, usually lasting until about noon, then becoming better in afternoon and evening—not the slightest pain or redness in or about the eye, only a slight itching upon lower lid, and this latter annoyed but a short time. Soon after the eye trouble began he came home and at once consulted his family physician, who said it was but a simple difficulty which would shortly wear off, probably thinking that no serious affection could attack an eye without causing it to be inflamed externally. The eyes continued thus without pain or injection, and normal in appearance. The mistiness or haziness of the sight continued every morning, but would pass away considerably by afternoon or evening, and then he could read by using both lenses of his ordinary reading eye-glasses over one eye. Upon Monday last he found that the usual afternoon clearing up was not sufficient to admit of his reading, and his condition has become daily worse. To-day R. V. = $\frac{1}{200}$. L. V. = $\frac{2}{200}$. No improvement with glasses.

Examination. Left eye. Cornea has a very peculiar dirty white or grey appearance, as though the epithelium was much thicker than normal, and opaque, somewhat the appearance of sugar frosting upon a cake, even so far as having the little points of depression, as though pins had been used to puncture. At one spot it has the appearance as though a piece of the epithelium had been scraped off with the finger nail, leaving clear corneal substance. There are also punctate spots of greater opacity. Anterior chamber of normal depth. Pupil does not respond to stimulus of light and is about one-half dilated. Posterior synechia supero-temporally. Can get only a red reflex from fundus. Cannot even see where the disk is. When patient looks upwards and I look through the lower half of cornea, I cannot get a red reflex even. Tension *plus.* No circumcorneal injection or even enlarged veins of conjunctiva; palpebral conjunctiva slightly hyperæmic.

Right eye. Cornea has same epithelial opacity as left; also same small depressions as though a pin had been used to penetrate; also same spots of increased opacity. Anterior chamber normal in depth. Pupil gives no response to light, and has posterior synechia infero-nasally. Nothing but red reflex from fundus, and no reflex when looking through lower half of cornea. Tension plus. No circumcorneal injection; slight palpebral conjunctivitis.

Atropia used, and thirty minutes afterwards left pupil was dilated well, but one synechia; right pupil dilates well nasally and, here one synechia, but temporally does not dilate well; think there may be large adhesions but cannot see sufficiently clearly to be confident, because of corneal opacity.

After atropine R. V. = $\frac{8}{200}$. L. V. = $\frac{10}{200}$. No syphilitic history.

I cannot make a positive diagnosis. It looks greatly like a chronic glaucoma, but the corneal opacity does not resemble that usually seen in glaucoma. It more nearly resembles interstitial keratitis, but the peculiar appearance of corneal epithelium I never have seen before. It seems purely a thickening or proliferation of epithelium with no hyperæmia; then the deep anterior chamber and posterior synechia are not like glaucoma, although the synechia may be a result of previous inflammation, but he cannot remember ever having had a conjunctivitis even, previous to his present trouble. The thickened condition of the epithelium could hardly have come with anything but a keratitis; still a keratitis without a circumcorneal injection is rare. The synechia and deep anterior chamber is probably the result of an iritis, Still, an iritis of sufficient importance to cause adhesions is usually also accompanied by circumcorneal injection.

Viewing the case as a kerato-iritis of sero-plastic nature, with glaucomatous symptoms, I gave atropine, gr. iv ad ℥j, gtt-j. t.i.d. in eyes. Ung. hydrarg. as an inunction twice daily. Sat. sol. kalii iodidi gtt. x. t.i.d., increased daily two drops.

December 17, 1881. R. V. = $\frac{9}{200}$. L. V. = $\frac{10}{200}$.

Right eye. No redness; cornea clearer than when last seen; at temporal side there are the same spots where the epithelium seems to be absent, and where cornea is comparatively clear. Iris almost fully dilated excepting nasally at synechia. Can only get red reflex, and not this through the lower half of cornea. I can to day see the characteristic dark punctate spots on membrana Descemet, of serous iritis; they are very marked indeed, particularly at lower part—here they are almost a mass, which accounts for impossibility of getting a red reflex when looking through the lower part of cornea.

Left eye.—Epithelial opacity has become markedly thinner. Iris fully dilated excepting temporally at synechia. Same dark deposits upon Descemet's membrane seen here as in right eye, very marked, particularly in lower half. A little to temporal side of center of pupil is a shadow running downwards and inwards, seemingly in lens. Patient can now, after examination, easily read $\frac{20}{200}$ with either eye; he also says that yesterday he was able to read in the afternoon by aid of his glasses.

The cause of the morning blindness was undoubtedly the opacities in the aqueous which gravitated to the lower part of the anterior chamber in latter part of the day, leaving the pupillary center clear. Same treatment continued. December 22, 1881. R. V. = $\frac{20}{30}$; L. V. = $\frac{20}{100}$. Right eye. Corneal epithelium all clear to-day, some cloudy opacity in the lower part of the cornea evidently in posterior layers of corneal substance distinct from deposits upon Descemet's membrane, it being in an anterior plane and only dark from its opacity, and in certain lights looks light colored and seems to consist of numerous spots of opacities connected by threads of similar opacities, resembling very much interstitial keratitis. Descemet's membrane is covered with punctate dark spots, particularly the lower half where they are still in mass; they can be seen to-day perfectly, because of the clearness of the corneal epithelium; they are evidently brownish spots of pigment upon inner surface of the cornea and not light colored in any illumination.

Synechia seems upon the point of breaking. Can see the fundus indistinctly, which appears normal.

Left eye. Corneal epithelium clear and normal. Corneal substance affected in posterior layers in the same manner described in right eye, but to a less degree. Punctate spots on Descemet's membrane very marked indeed, particularly on the lower half. Synechia posterior is more marked than in the right eye but is passing away. Fundus shows no evidence of any internal disease.

December 27, 1881. R. V. = $\frac{20}{20}$; L. V. = $\frac{20}{100}$. Has been using atropine in each eye six times a day, kalii iodidi gtt. xxx, t. i. d. and inunction of ung. hydrarg, once a day. Stomach not good for past few days, has had pain but no nausea. Gums not sore; has very poor teeth and it is somewhat difficult to tell when they are affected mercurially. Breath is mercurial, though not particularly so. He says that his sight is for distance apparently as good as ever; left eye was never as good as the right.

Examination. Right Descemet's membrane much clearer in upper half, but the lower is still largely covered with the deposits. Synechia much less than before, being now a mere thread of attachment. Fundus still seen somewhat indistinctly.

Left cornea almost entirely clear, only a few spots on lower half of Descemet's membrane. Synechia entirely gone. Fundus entirely healthy, may be slightly astigmatic.

Jan. 4, 1882. R. V. $\frac{20}{30}$; H. T. = + $\frac{1}{72}$; L. V. = $\frac{20}{100}$. E.

Right synechia not yet broken; Descemetic spots much less. Slight haziness in fundus, which I fear may not be entirely caused by the corneal troubles. Has had no evidences of mercurialization. Told to decrease the iodide to gtt. xv t. i. d.; increase inunction to three times a day, and, as his throat is quite dry, must decrease the atropine.

Jan. 10. R. V. = $\frac{20}{30}$ +; L. V. = $\frac{20}{100}$.

Right synecchia not broken, still some slight blurring of the fundus.

Left cornea clear, only few spots to be seen; fundus clear and healthy.

I used atropine in the patient's eyes this morning, one drop every ten minutes for two hours. His throat became very dry indeed, and there was increased dilatation of the pupil, but no rupture of the synechia. Told to continue inunction three times a day, kalii iodidi gtt. x. t. i. d. and atropine as much as possible, and not have his throat too dry.

Jan 18. R. V. = $\frac{20}{30}$ +; L. V. = $\frac{20}{100}$.

Right, synechia not yet broken; very few Descemetic spots. Pupil widely dilated; fundus slightly hazy in parts, perhaps a little clearer than upon last visit.

Left, normal in every particular. Given eserine gr. jv ad. ℥i. gtt.j. in eye t. i. d. Inunction only once a day; iodide as before.

Jan. 22. R. V. = $\frac{20}{20}$; L. V. = $\frac{20}{100}$.

Both pupils considerably contracted; I used atropine to dilate pupil. I found the synechia in right eye not broken, and but few Descemetic spots remaining. Told to continue using eserine for two weeks, and, as he is anxious to return to and retain his situation, from which he has been absent for over a year, I have permitted him to begin his labors, but to use care in doing so.

Feb. 5, 1882. R. V. = $\frac{20}{20}$; L. V. = $\frac{20}{100}$.

The synechia of right eye not yet broken; told to continue eserine in this eye only.

Feb. 19. R. V. = $\frac{20}{20}$; L. V. = $\frac{20}{100}$.

Right pupil much contracted and circular; Descemetic spots but few, only three or four. I used atropine to dilate pupil and found synechia not broken, though much stretched and attenuated. Fundus clear and seems normal in every particular. It is evident that the synechia is so attenuated that any contraction or dilatation of pupil cannot draw upon or break it, and, such being the case, it can cause but little, if any trouble. Told to discontinue use of eserine and atropine; to continue inunctions and kalii iodidum for a time, and to see me when necessary.

This case is interesting because of its close resemblance to glaucoma in history and appearance. The peculiar epithelial opacity and deep anterior chamber being the only points in which, upon first examination, it differed from glaucoma. In this particular it would certainly be a stumbling block to many practitioners, and for this reason it is worthy of study. It can hardly be called a serous iritis, because the iritic process was also plastic; it cannot be called simply a Descemetitis because there was also an interstitial keratitis and iritis.

It is also interesting because of there being a plastic iritis and a keratitis both interstitial and epithelial and at same time having no circumcorneal injection.

For these several reasons then, it would seem improper to call the case a serous iritis, but rather a non-inflammatory kerato-irido-Descemetitis.

CLINICAL OBSERVATIONS.

BY P. B. WALDMAN, M. D., READING, PA.

CASE I.—PARESIS OF INFERIOR RECTUS MUSCLE, PROBABLY REFLEX FROM TRAUMATISM.

Mr. J. S., æt. 22 years, while at work received an injury from the "bursting of a flask," a large piece striking his right cheek and knocking out several teeth, numerous small particles flying into the eye. One hour after the injury the eye was cleaned by removing all foreign bodies, and in three days he was apparently well.

On the sixth day after the injury he presented himself again, stating that he saw everything double, the objects being one above the other, and that he could not work, owing to confusion of objects.

On examination with a lighted candle placed at a distance of twelve feet, the false image belonging to the right eye was below and to the left of image belonging to left eye, and they were about two feet apart. When the conjunctiva was grasped with a pair of fixation forceps and eyeball drawn downward the images became fused.

I performed a careful tenotomy of the superior rectus of right eye. which was followed immediately by single binocular vision. Now, about six weeks since tenotomy, the patient reports that the result has remained good.

CASE II.—A CASE OF "NUCLEAR PARALYSIS" OF THE THIRD NERVE. SUPPLYING THE EXTERIOR MUSCLES OF THE EYE.

I publish the following case, thinking it to be of some interest, as it presents such a clear picture of central paralysis.

John Hall, æt. 48 years, consulted me Dec. 20, 1885, giving the following history: On the night of Dec. 16, 1885, he retired perfectly well; in the morning on awaking he could not raise his left eyelid. No other symptoms.

Stat. præs. Complete ptosis; upon raising the lid, the eye is seen to be divergent. No motion directly upward or downward, slight motion down and outward (superior oblique) slight lateral motion, contraction and relaxation of external rectus. *Pupil and accommodation are intact*; size of pupil same as that of right eye, 4 millimeters, and active; reads Jaeger No. 1 at 8 inches with + 1 D. (Has worn + 1 D for near vision for four years.)

The lesion in this case is, no doubt, a central one, and not involving the centre for the intraocular muscles, which lies anterior to that for extraocular muscles (Kahler and Pick[1]), and thus explains the normal action of the pupil and accommodation.

The treatment in this case consisted in a free tenotomy of the external rectus, and hypodermic injections of strych. sulph. daily, commencing with one-fortieth of a grain and increasing to one-sixth of a grain. The result is a perfect cure.

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[1] Mauthner's Vortraege, Heft XII.

REPORT.

The following report of a lecture on polarized light, delivered before the society of German Physicians of St. Louis, by Dr. C. O. Curtman, professor of chemistry in the Missouri Medical College, was kindly written for the JOURNAL by the lecturer himself. We think there is enough of interest in it to warrant its publication in our columns.—[EDITOR.]

At the meeting of the Verein deutscher Aerzte, April 2, 1886, Dr. C. O. Curtman read a paper on Polarized Light. After explaining the nature of polarization by reflection, by single and by double refraction, he made a number of experiments with the projection-polariscope. The production of complementary colors by double refraction and their union to white light was exhibited on the screen. The effects of position of polarizer, and analyzer to each other were shown in transmitting light when parallel and quenching it totally when crossed. Beautiful color effects were produced by interference of rays in crystals of quartz, selenite, benzoic acid, etc.

A Laurent-Mitscherlich instrument (*á penombre*) was then used to show the circular polarization of sugars, albumens, quinine, etc., and its application to the rapid analysis of glucose or albumen in urine, was tried by the members present.

Attention was especially called to some experiments described by Herschel, showing the utility of polarized light for signalling, so that only a party provided with an analyzing prism can read the signals. Also the application of the same method to the removal of the glare of reflection of polarized rays from surfaces of water, so that the observer with the analyzer can look deep down below the glistening surface. *Dr. Curtman proposes to employ the same method to overcome the annoyance of the glare of reflection from surfaces of water, from fields of snow or ice, and from the glass windows of sunny streets, by using thin transparent tourmaline plates, mounted in circular spectacle frames, so as to enable rotation of plates. His experiments proved that a printed page covered by a plate of glass, whose re-*

flection prevented a sight of the object below it, was easily read by means of a tourmaline adjusted so as to quench the polarized rays and to transmit only the ordinary light.

The introduction of such spectacles would prove valuable to pilots and others having to keep a sharp lookout on glistening surfaces of water; also to tourists and others whose eyes suffer from the irritating glare of reflected polarized light.

CORRESPONDENCE.

"36" OR "40".

The question raised by Dr. Coggin in the February number of this journal (page 50), regarding the equivalent of the metre-lens (*dioptrie*) in the series of glasses numbered according to the old system, admits of a positive answer.

The unit of the metric system (*dioptrie*) is a convex lens whose principal focal length is equal to one metre.

The unit of the old system, as determined by the usage of the French opticians and adopted in ophthalmic practice upon the authoritative recommendation of Donders, is a double-convex lens with radii of curvature, at its two surfaces, equal to one Paris inch.

As a rough approximation it is often assumed that the focal length of a lens numbered according to the old system is equal, in Paris inches, to the denominator of the fraction by which we express its value; this would be strictly correct if the index of refraction of glass were exactly 1.5 (3:2), and the formula of the double-convex lens would then have the very simple form, $\frac{1}{f} = \frac{2}{2r} = \frac{1}{r}.$

But the index of refraction of crown or plate glass is actually greater than 1.5, and varies, in different specimens, between the limits 1.517 and 1.542.

If we could select for the manufacture of spectacle lenses a plate glass of the index of refraction 1.541, taking the radii of curvature of the two surfaces of a double-convex lens equal to forty Paris inches, the resultant lens would have a principal focal length of 36.96 Paris inches, or one metre, which is equal to 39.37 English inches.

If the double-convex lens with radii of curvature equal to forty Paris inches is made of crown or plate glass whose index of refraction is 1.5326, substituting this value for μ (the index of refraction) in the formula of a very thin double-convex lens, we obtain:

$$\frac{1}{f} = \frac{2\,(\mu\text{-}1)}{r} = \frac{1.0652}{40}$$

$$f = \frac{40}{1.0652} = 37.55 \text{ Paris inches} = 40 \text{ English inches.}$$

It is found by trial that the glass numbered $\frac{1}{40}$ according to the older French system has a focal length of about thirty-seven Paris inches, or very nearly forty English inches. The error in assuming $\frac{1}{40}$ as the equivalent of the metre-lens (*dioptrie*) is almost exactly .01575 *dioptrie* = $\frac{1}{2540}$; an error so small as to disappear in the presence of the far greater errors arising from differences in the refractive index of crown or plate glass from different manufactories, and from errors of observation incident to the most accurate measurements of the refraction of the eye.

In the glasses of European manufacture, as generally found in opticians' shops in this country, the focal length in English inches is expressed, without appreciable error, by the numbering of the glass; and the same is true of glasses of American manufacture, so far as I have measured them. The error involved in the adoption of $\frac{1}{40}$ as the equivalent of the *dioptrie* is at most only about one-fifth as great as it would be were we to adopt $\frac{1}{36}$. The suggestion to take $\frac{1}{36}$ as a special "American" *dioptrie* ought, therefore, not to prevail; by adopting it we should, moreover, set up a new standard, differing materially from that actually in use in Europe, and needlessly abandon the fundamental principle of metric uniformity.

John Green.

St. Louis, March 1, 1886.

To the Editor of the American Journal of Ophthalmology:

Dear Sir:—In the current number of your journal is a communication headed, "36 or 40; Which shall it be?"

In answer to this question concerning the real and nominal strength of lenses, a word or two from a manufacturer and importer will, I trust, be neither out of place nor unwelcome.

The answer is "40," for the following reason: Although the greater bulk of fine lenses used in this country for the making of spectacles comes from Paris, those not ground on the metric system, are ground in *English* inches, which a comparison of the curved surfaces and focal distances of the lenses will readily demonstrate.

There are thirty-nine and thirty-seven one hundredths (39.37) English inches to the metre, so nearly "40" that the error in this approximation is less than a third of a dioptre in the strongest glass, the $+\frac{1}{2}$ and $+$ 20 D differing by only .315 of a dioptre.

The fact that thirty-six (36.93) Paris inches make a metre, and that thirty-six may be divided into more convenient aliquot parts than forty has nothing to do with the question, as long as spectacle lenses as a commercial article are *not* ground in Paris inches.

If Dr. Coggin has a Roulot case in which 1 D is stronger than a lens of thirty-six American inches, it only confirms the opinion that Roulot's cases are not particularly reliable.

The writer has reason to believe that a supply of *American* test cases, accurately made in accordance with either of the well known standards, would soon follow any demand for such cases.

E. B. Meyrowitz.

New York, March 6th, '86.

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CLINICAL NOTES OF CASES.

BY M. F. COOMES, M. D.

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CASE I.—Some ten years ago Mrs. B. had an eye removed, and in a few days an artificial one was placed in the cavity. The first eye was afterward broken, and another was introduced. This breakage and substitution continued, and with it the dimentions of the cavity grew less and less, until finally the difference between the two eyes was so great as to render the woman unsightly. The shrinkage was no doubt brought about by introducing eyes that were too small, and improperly fitted. She applied to a surgeon who proposed to operate and increase the size of the palpebral fissure. At first this looked to be the rational method of procedure. However, it seemed impossible to increase the size of such an opening by any cutting operation, and leave it in such a condition as would render it possible to retain an artificial eye. Being thoroughly satisfied that a cutting operation would fail, I advised her to pack the cavity with wet cotton wool, and to place a bandage over it, changing the cotton once in twenty-four hours. This produced so much irritation that it had to be abandoned. It was thought that she might be able to wear the eye reversed, i. e., turning the concave surface forward, filling it with wet cotton wool, and applying a compress. This worked like a charm, giving her no inconvenience. In a month the cavity was so much increased in size as to make it possible for her to wear an eye almost as large as the natural one. There was but little difference, and notwithstanding the fact that she was a fastidious woman, she was satisfied.

Cases II and III.—In a recent issue of your Journal, I notice the report of some cases of conjunctival tumors containing a growth of hair. I reported two such cases in the *Medical Herald* a few years since, and now send you an extract of the report with the important points connected with the cases.

The first case was in the person of a boy about fifteen years of age. The tumor was located on the ocular conjunctiva of the upper and outer portion of the left eye, and was about the size of a small hazel-nut. It seemed to be lying loosely between the conjunctiva and globe.

Growing from the upper surface of the tumor, near its centre, were three long hairs, one of them measuring more than two inches in length: the hair resembled that of the beard, with the exception that it was curled up into a perfect ringlet. The tumor gave but little inconvenience, aside from the excessive flow of tears over the cheek.

The conjunctiva was laid open and the tumor removed by dissecting it out of the loose tissues. The wound was closed with silk sutures, and, in the course of a few days the patient was sent home and has had no trouble since.

The second patient was a little girl, some six years of age: the tumor was in the same locality as in the former case, and about the same size, and had three hairs growing from its top, or lid-surface. The hairs in this case, were not so long as in the first. I advised the father to have the growth removed, but he declined, and I have not heard from the case since.

Case IV.—John B., a striker in a plow factory, while engaged at his occupation in 1879, a small piece of steel flew from the hammer and passed through the sclera of the right eye, entering just outside the cornea, in the horizontal meridian on the temporal side.

I saw him on the day following the accident, and detected the piece of steel attached to the posterior surface of the lens. It had undergone no change and still retained its *bright reflex.* The lens showed signs of inflammation, and there was considerable photophobia. I advised him to protect the eye, and use a solution of atropia and morphia, and bathe the eye in cold water. There was considerable ciliary irritation accompanying the injury; the lens became cataractous, but did not undergo absorption. The irritation gradually subsided, and the cataract remained unabsorbed. I saw the patient a short time since and found the cataract unchanged, and the piece of steel still in its former position. The patient is able to distinguish light with the injured eye, showing that the retina is still in a condition to receive impressions. This case illustrates the tolerance of a foreign body within the globe.

SOME THOUGHTS ON ASTIGMATISM OF CURVATURE.

BY H. CULBERTSON, M. D.,
Assistant Surgeon U. S. Army, Retired.

Observation and a consideration of authority have led me to believe that the crystalline lens takes part in the induction of regular astigmatism as well as the cornea. Just how the longitudinal, oblique or circular fibres of the ciliary muscle effect this, acting upon the lens, has not, so far as I am able to determine, been satisfactorily shown by the many able authorities consulted. As to the *modus operandi* of accommodation also, those who have investigated this subject most closely, draw diverse conclusions. Hence as to both of these themes we can only draw inferences from practical demonstrations and phenomena.

Speaking of astigmatism, the results of states of the "*crystalline*" (lens), Dr. E. Landolt, says[1] "The '*crystalline*' (lens) often takes part in the induction of regular astigmatism, at times in a passive, and again in an active manner. The first case is recognized when the ocular globe, at least its anterior part, is less convex in one direction. Then the '*crystalline*,' flattened, so to say, in one meridian, will approach the conformation equally flattened of the cornea, and the static crystalline astigmatism will be directly added to that of the cornea. Again the principal meridians of the astigmatic lens may not have the same direction as those of the cornea; at another time they are parallel, but in such a manner that the maximum of curvature of the crystalline corresponds to the minimum of that of the cornea; and the meridians least convex of the lens are in the same direction as those the most convex of the cornea. It is thus that the crystalline astigmatism may compensate, partially, or totally, for that of the cornea, or even may exceed it in degree.

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[1] See Landolt. La Réfraction et l'Accommodation de l'Oeil, p. 291.

Based upon numerous measurements and calculations, Donders, had already formulated this important conclusion, in 1864, in saying that with a high degree of asymmetry of the cornea there is found also an asymmetery of the crystalline which acts in such a direction that the total astigmatism of the eye is almost always inferior to that of the cornea.[1] This lens astigmatism, the inverse of the corneal, is more frequently what may be called active or dynamic, and due to an unequal contraction of the ciliary muscle, which causes the lens to become more rounded in one direction than another, and in the interest exactly of a correction of an astigmatism of the cornea. It was Dobrowolsky, who discovered this fact, which is supported by numerous proofs in his work.[2]

We are able, at once, easily to detect that the eye is able to overcome, by a certain effort, feeble cylindrical glasses. By what mechanism will it be possible to neutralize the unequal contraction of the ciliary muscle followed with a corresponding change in the form of the crystalline lens? This muscular action, unusual and against nature in a non-astigmatic eye, is otherwise revealed by a sensation quite disagreeable, and which by its resemblance to that which we experience in fixing the punctum proximum, admits of no doubt as to its origin. On the other hand Hensen and Voelckers, have proved, by experiments on animals, and by clinical observation that, when there is a lesion of a single branch of the ciliary nerves, its excitation will cause a contraction of a distinct part of the isolated sphincter of the iris and of the fibres of the ciliary muscle. The contraction of the muscle limited to one meridian, causing the crystalline to relax unequally and making the lens take a form more convex in one meridian only.

But the most conclusive proofs are the clinical observations of

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1. Donders, Accom. and Refract. Eng, Ed. p. 492. Germ. ed. 416.

2. See his work. Ueber verschiedene, Veraenderungen des Astigmatismus unter dem Einflusse der Accommodation. (Arch. fuer Ophth. XIX., III., p. 51, 1868.

M. Dobrowolsky, and of all those who have repeated his experments.[1]

In paralyzing the accommodation by the energetic and prolonged use of atropine, we sometimes detect regular astigmatism where there was no trace of it before using the agent, or when the accommodation was intact. The mydriatic exercising no influence upon the cornea, but only upon the form of the crystalline through the agency of the ciliary muscle, we are forced to admit that the astigmatism which becomes manifested by the employment of the atropine, is due to the cornea, and has been masked, neutralized, and corrected by the unequal contraction of the ciliary muscle, and the form of the lens, which is astigmatic in the inverse direction to that of the cornea.

In other cases an astigmatism already detected in the normal state, augments as a result of the paralysis of accommodation. This proves that the irregularity of the corneal curvature has only partially compensated that of the crystalline.

At other times, finally, the astigmatism changes in direction under the influence of the mydriatic, that is to say, the meridian of greatest refraction before the instillation of atropine presents the minimum of refraction after its use, and inversely. In this case the corneal astigmatism was over-corrected by that of the crystalline, due to the action of the ciliary muscle. Without having recourse to the mydriatic, the latent astigmatism is revealed in some with the ophthalmoscope, the attending spasm of the ciliary muscle ceasing during the examination.

We have said above, that the difference in the two meridians, perpendicular to each other, may on looking obliquely through a spherical lens, induce astigmatism, or in other words, when the axis of the lens does not correspond with that of the eye, or when it is not centered in relation to it. We have said, also (p. 112, loc. cit.) that such a manner of adapting lenses to the eye is desirable at times. This irregularity, neglectable in most cases, may attain a degree so elevated as to produce a manifest astigmatism. It is thus that Donders detected, in his own eye, a regular astigmatism, attributable to a slight inclination of the crystalline, and also in another case, observed in a young man, aged twenty years.[1]

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[1] Mauthner. Die Optischen Fehler, etc., p. 734, 1876. Javal et Schioɛtz, Un Ophtalmomètre pratique (Ann., d'oc., Juillet, 1881, p. 1). Landesberg, Ueber das Aufreten von regelmaessigem Astigmatismus, etc. (Arch. fuer Ophth., xxvii, ii, p. 89, 1881.)

Cases of congenital ectopia of the lens, or of partial luxation, followed by astigmatism, have been observed.

Admitting the fact that the crystalline takes part in the production of astigmatism, it is evident that the lens is susceptible to change from age, under the modifications to which it is subjected. The static refracting force of the lens diminishing as the equalization of the index of refraction of its several layers occurs, its static astigmatism should diminish equally. But it is above all the dynamic astigmatism which varies with the diminution of the force of accommodation. Thus it is that the astigmatism of the eye becomes augmented with age in proportion as the crystalline becomes unfitted to correct it under the influence of the contraction of the ciliary muscle. In the case, on the contrary, where the astigmatism is produced by hyperspasm of the ciliary muscle; we see *it* diminish with the enfeeblement of the accommodation as age advances."

* * *

The foregoing quotations would seem to convincingly show that there is such a state as astigmatism of curvature (A^c.) Indeed Landolt in his work cited, and in the first volume of the Traité Complet D'Ophtalmologie, by L. DeWecker et Landolt, 1880, introduces a chapter upon ametropia of curvature, after having considered axial ametropia. Just how this ametropia of curvature is induced, is still a question. My own convictions on this subject have been induced, to a certain extent, by measurements with my prisoptometer, which determines ametropia with a greater accuracy than do test types. Thus through its aid, if there is found before the use of duboisine, one dioptrie of simple myopia, and on instilling that agent, the ametropia disappears, it is clear the defect was due to the action of the ciliary muscle, now paralyzed. Again, an ametrope develops = — D 1. sph. $\asymp$ — D 0.5 cy. myopia, and, on thoroughly using duboisine, the spherical defect remains, but the astigmatism has vanished. Again, there is an astigmatic myopia = D 0.5 cy., and on paralyzing the ciliary muscle, this not only disappears, but there is developed a hypermetropic astigmatism = + D 0.5 cy. The latter may be due to the cornea, but the former would seem to be due to ciliary muscularity acting upon the lens in this case In the correction of such a case as the last, better remote vision is often induced by the negative cylinder, and the proximal sight is better with a positive cylinder, and adults as well as children accept thus the one or the other positively.

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[1] Donders, loc. cit. p. 532, Eng. Ed.; p, 447, Germ. Ed.

The adaption of lenses in the correction of ametropia upon its *manifest* degree, without mydriactics, is certainly an important subject. Especially is it interesting, when we consider, that. perhaps the larger number of spectacles, adapted to eyes in this country, are applied by more or less skilful opticians; upon the *manifest* states of refraction and without the use of mydriatics. While perhaps generally such corrections are satisfactory to the patient, and, while not urging such a mode of procedure, the apparently favorable results merit attention. While depending upon nothing less than a knowledge of the *latent* as well as the *manifest* states of refraction, a fair trial of the correction based on the former, may prove unsatisfactory, and a resort to *that* indicated from the latter examination, will be successful in practice.

Keeping these conclusions in view, the question to be solved in a given case of simple myopic astigmatism of curvature, would seem to be, shall the myopic focus be thrown back upon the emmetropic retina, in one meridian, or shall the normal focus of the meridian at right angles to the *former* be brought forward on the same plane as that of the myopic focus.

Take a case of simple myopic astigmatism of curvature = — D 0.5 cy. The retina is found at 20 m m from the cornea. =F″ =f.″ The nodal point (emmetropic) is 15 mm from F″ or ς'', or 5 mm behind the cornea which is = the radius of curvature of the cornea = r. The anterior focal distance is 15 mm in front of the cornea = ς'. The index of refraction of the eye is

$1.333 = \frac{4}{3} = n$. These are the optical constants of Donders' reduced eye. Let the object be placed at D 0.5 = 2000 mm. from the cornea = the punctum remotum = R = f′. As it is the length of the radius of curvature of the lens which varies the normal radius r, what will be the value of r in this example in the defective meridian.

Employ the formula given by Landolt, loc. cit. p. 133, or

$$r = \frac{f'\,f''\,(n-1).}{f'\,n + f''}$$ Substituting

$$r = \frac{2000.\ 20.—(1.333—1)\ .333}{2000.\ \ 1.333.\ + 20.} =$$

$$\frac{13320.000}{2686.000} = 4.959 \text{ mm.}$$ Hence,

$F'' = f'' = \varphi''$ in this case = four times this radius or 4x4.959 = 19.836 mm. $F' = f' = \varphi'$ in this case = three times this radius or 3x4.959 mm. = 14.877 mm. The foci are each shorter in one meridian as well as the radius in such an eye, and in the same plane the nodal point is advanced and its refraction increased. If this error of refraction be corrected by placing a — cylinder at φ' = 15 mm. from the cornea; the glass being = — D 0.5 = 2000 mm. less φ' or 2000.— 15 mm. = 2985 mm., or = — D 0.335; then r will become 5 mm. and F″ 20 mm. The image upon the retina will

$$= \frac{K\ \varphi'' = G'' = \text{emmetropia} = 15 \text{ mm.}}{K\ \varphi'' = \gamma'' = \text{ametropia} = 15 \text{ mm}} = \frac{1}{1} \text{ or } 1.$$

It follows that remote vision will be emmetropic in a normal eye.

How will the image be affected if + D 0.5 cy. be applied axis at right angles to the former—cylinder? It should be recalled that this example is a myopia of curvature in one meridian with the opposite, at right angles to it, emmetropic. The application of this cylinder = + D 0.335 at φ' will cause the F″ to be advanced 0,164 mm in the given meridian, and now the—focus and *this* + corrected focus will be on the same plane, and both in front of the retina. If the ciliary muscle does not relax, distant vision cannot be distinct. If, however, the object be approached to the eye, the divergency due to proximity will cast the foci of each meridian upon the retina, and proximal vision will be distinct. The foci of each meridian being 0.164 mm. in front of the retina, what distance must the object be approximated when the object R is at 2000 mm from the cornea = F′. The relation between the former quantity and the latter and the normal $\varphi'' = 20$ mm. must give this. Hence, as 20 : 0.164 : : 2000 : 16.4 mm. = D 0. 61 = approximation of object. This diminution of R or f″ renders less accommodation necessary in near vision = D. 0.61. If the party desires to read at 3 dioptrics from the cornea, the accommodation required will be = D 3 — D 0.61 = D 2.39 or a saving of ciliary muscle force of over 20 per cent due to the approximation. By the application of the + cylinder = D 0.5 — 15 mm. at φ', the nodal point has been restored to 5 mm. and hence the retinal images become = $\frac{1}{1}$ or 1. Thus it is, in proximal vision, that the + cylinder gives comfort and equally as distinct vision as the negative cylinder does in the remote.

But it may be inquired what will be the effect of this approximation of the punctum proximum, upon the increased force exercised by the internal recti, or upon the *punctum convergens*, (P^c). Suppose that at 20 centimeters = D 5.0, the ametrope can just overcome a prism of 10° placed before each eye, and that the base line or distance between the pupils for parallel rays = 64 mm. Nagel[1] gives the value of the "*angle metrique*" (A. M.) with such a base as 1.833° exactly 1°5′. The angle of deviation in such a case would $= \dfrac{10° + 10°}{4} = 5°$ for one eye. Divide this quantity by the value of the angle of convergence at 1 meter $= 1°\,50' = \dfrac{5°}{1°\,50'} = 2.72$. "*Angle Metrique*" (a. m.) Add to this the D 5. of accomodation, or D 5. + 2.72 = 7.72 a. m. which represents the power of each internal rectus. But this ametrope desires to read at D 3. or 33 cm. Hence the a. m. at this distance would be represented by 2.72 + D 3, = 5.72 a. m. But it is found that this ametrope is compelled to use a greater force of the internal recti from the greater proximity of the object to the eye. This power is = D 0. 61. Hence, 5.72 a. m. + D 0.61 = 6.33 a. m. There is therefore in this case a reserve force in each internal rectus = 7.72 — 6.33 = 1.39 a. m. Hence the approachment of the object to the eye does it no injury, and the object is seen clearly in near vision.

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[1] ee Landolt loc. cit. p. 184.

OPHTHALMIC NOTES.

BY CHAS. J. LUNDY, A. M., M. D.

Professor of Diseases of the Eye, Ear and Throat, in the Detroit College of Medicine.

CASE I.—*Glaucoma following the Sting of a Bee.*—On October 22, 1884, Mrs. Montier, æt. 50, came to consult me regarding her eye. She gave me the following brief history: Four weeks before, while watering flowers in her garden she was stung upon the eyeball by a humble (bumble) bee—the *bombus terrestris.* The sting was in the region of the insertion of the rectus externus of the left eye. The tissues at once became greatly congested and swollen, and very painful. The swelling extended to the lids and side of the head and face, and the former were so œdematous that it was almost impossible to open the eye for several days. The pain was continuous and soon became so severe that no sleep could be obtained for several days, although the attending physician gave anodynes freely. Sight failed rapidly, and at the end of a week she had scarcely perception of light.

Upon examination, I found the following conditions. Eyeball greatly congested, especially in the ciliary region, the cornea lusterless and almost devoid of sensibility, the anterior chamber extremely shallow, and iris in contact with the cornea at ciliary border, the aqueous humor cloudy, the pupil dilated and immobile; the iris discolored and muddy looking, the lens and vitreous humor hazy, tension +3, and no perception of light. On account of the hazy condition of the media no view of the fundus oculi could be obtained.

I advised enucleation, but the patient would neither consent to enucleation nor sclerotomy, which latter was proposed when enucleation was rejected. Eserine, gr. ij ad ℥j was ordered instilled every hour. This slightly reduced the hardness of the globe and afforded some relief from pain. The improvement was transient, however, for while she slept without anodynes for the first time in four weeks, the relief from pain was of only four or five days' duration. At the end of a week the tension and pain were as great as at first consultation. Atropia was now tried but with no particular benefit. After a time she consented to let me perform a sclerotomy. The operation afforded some relief from pain, and the tension on the day following, was not above +2. The relief was temporary, however, and she soon began to suffer again, and in time pain became as severe as before. Being now nearly exhausted from her long continued sufferings, she submitted to enucleation. Assisted by Dr. A. B. Chapin, I enucleated the eye on Nov. 5th, '84, using cocaine as the anesthetic. On examination the eye presented the usual appearances of glaucomatous eyes. In regard to the use of eserine in such cases, I have often observed that it reduces the tension and mitigates the sufferings for a short time, but that increase of tension returns again after a certain period. This may be due to the fact that the ciliary muscle upon which it acts so powerfully soon undergoes atrophic changes in glaucomatous eyes, and that it is incapable of exercising the beneficial influence which it does in primary acute glaucoma, if used early.

Case II.—*Epileptic Convulsion during a cataract operation.* Duncan G., æt. 32, consulted me May 16th, '85. He had a mature, soft cataract in right eye. The left eye was totally blind as the result of a severe inflammation five years before. On the 19th of May, assisted by Dr. Wean, I extracted the cataract at Harper Hospital. Cocaine was the anæsthetic employed, and of this two drops of a five per cent solution were instilled into the eye every two minutes for a quarter of an hour. Nothing peculiar was observed about the patient until I had completed my linear incision after the method of Von Græfe. I then observed that the patient was acting and breathing peculiarly, and the speculum was quickly withdrawn, and firm pressure made over the closed lids. Scarcely had the eye been closed when the patient uttered a peculiar cry, so familiarly known as the "epileptic cry," and at once his body was violently convulsed. After the lapse of some minutes he regained consciousness, the cyanosis of the head and face disappeared, and the effects of his fit were soon over. After the lapse of several minutes the operation was proceeded with, and terminated as successfully as if nothing had occurred. Not only was the lens entirely removed, but it was observed that the capsule was opaque, and it also was removed. Not a drop of vitreous was lost, and, except for the delay, everything was as smooth as in any operation.

Immediately after recovery from the epileptic attack it was observed that his pupil was dilated to a remarkable degree, and after the extraction of the lens and the opaque capsule, the assistants could plainly see the vessels of the retina with the unaided eye. Strange to say the pupil never contracted again during his stay in the hospital. The final result was not satisfactory for some inflammatory reaction followed the operation and the vitreous became cloudy and did not clear up. Whether the inflammation resulted from the effects of the operation and the convulsion, or from his subsequent bad behavior, I am unable to say. He removed his bandage more than a dozen times a day, and in other ways was entirely beyond control. Both he and his friends denied that he had ever had epilepsy before, and while he had no other attack while in the hospital, yet I think he was an epileptic, for his mental condition was not good. Other similar cases may have been reported, but if so I have not seen them, or do not now recall them. I am at a loss to know the cause of the attack. The patient was positive he had felt no pain from the operation, and as the cocaine was not used hypodermically, I do not think the fit could be ascribed either to pain or to the drug.

Case III.—Wm. A., æt. 21, was brought to my office January 13, 1886, by Dr. Foster, of Reed City, Mich. About four weeks previous his left eye began to trouble him. There was slight pain, photophobia and lachrymation with inability to use the eyes for work, also some ciliary congestion; but these symptoms were not at all marked or severe. Two weeks later the left eye became involved, and presented much the same conditions. Iritis was suspected by his physician at the onset of the disease, but as the pupil dilated under atropine the diagnosis was abandoned. On first consultation I learned the foregoing facts, and also that the patient had contracted syphilis about a year and a half before, and that he had been treated for the primary and secondary lesions by two reputable physicians. On examination I found conditions as above described with an almost immovable pupil, and with small posterior synechia. The small amount of plastic matter in the inflammatory exudate was shown by the fact that there was little tendency to the formation of firm synechiæ. In the course of a few hours the pupils dilated widely under the influence of atropia. In neither eye could there be observed any punctate condition of the cornea such as we observe in serous iritis, and yet the small amount of plastic matter thrown out upon the iris and the subsequent history of the case pointed in the direction of a serous iritis. At the time, however, I regarded this as a case of iritis due to constitutional syphilis, and my readers must judge of the correctness of this view. The patient had been for some time taking anti-syphilitic remedies and the continuance of these and the local use of atropine were advised and the patient returned to his home.

Early in February he returned again, saying that for a week past his eyes had been worse. On examination, I found numerous small points of infiltration in each cornea. The cloudiness produced was not at all marked, but they grew more dense day by day. The case now presented the appearances of interstitial or parenchymatous keratitis in its incipiency, although the corneæ were perfectly clear when he first consulted me. Upon closely questioning the patient, I learned that his parents were healthy, and that there was nothing in them to indicate a syphilitic taint. His family history was remarkably free from evidence of scrofulosis, and the young man's health had always been good, and he did not suffer seriously from the syphilis he contracted a year and a half before. His case progressed favorably, and in eleven weeks he returned to his home with right cornea still a little hazy, and left cornea quite clear. Vision in R. E. $=\frac{20}{XL}$; vision in left $= \frac{20}{XV}$.

The questions which present themselves in connection with this case are: first, were his iritis and his keratitis due to one and the same cause? second, was that cause inherited syphilis? third, if it was not inherited syphilis, what was it? fourth, could he, having an inherited taint, acquire syphilis, as he undoubtedly did? for I have confidence in the medical gentlemen who treated him for primary and secondary lesions. [This seems to be one of the comparatively rare cases of kerato-iritis due to acquired syphilis. EDITOR].

REPORT OF THE OPHTHALMOLOGICAL PART OF THE SECTION OF OPHTHALMOLOGY, OTOLOGY AND LARYNGOLOGY.

Thirty-seventh Session of the American Medical Association held in St. Louis, May 4 to 7, 1886.

BY ADOLF ALT, M. D.

Tuesday, May 4.

The first paper was read by Dr. Jackson, of Philadelphia, on Retinoscopy (shadow test) for the detection of ametropia. He recommends for this method an ophthalmoscope with a flat mirror of a diameter of one inch and a half. Ophthalmoscopes of English or French make are therefore more useful for this method of examination, than American ones. He thinks this method especially adapted for the detection of astigmatism and, furthermore, in the examination of unruly patients, and in nystagmus.

In the discussion of the subject of this paper the main point elicited was, that retinoscopy is especially adapted to quickly determine the existence or non-existence of astigmatism of high degrees, or of hypermetropia and myopia combined with astigmatism.

The discussion was participated in by Drs. Fryer, of Kansas City, Johnson and several others.

The second paper was read by Dr. Dibble, of St. Louis., introducing his perimeter, for which he did not exactly claim originality, yet he offered it as an improvement on Foerster's, which it resembles very materially, being, however, lighter and cheaper and having a registering plate.

The main features of this instrument are, that it has an iron stand, instead of a wooden basis; that it can be taken apart and stored away in a box; that instead of a semi-circle, only a quadrant is being used, on which the object-bearer slides in the same manner as it does on Foerster's instrument. The author claimed that Foerster's instrument was too bulky and unhandy, and, furthermore, that the test of the visual field by the hands or the blackboard (Hirschberg) was unscientific.

After a recess for the inspection of the very neat instrument which costs only $50 in a proper box, an animated discussion took place upon the merits of the instrument. It seemed to be considered by most of the gentlemen to have peculiar advantages, while others stated that they could hardly see them. It was said by Dr. Fox, of Philadelphia, to be almost exactly like McHardy's, of London, which latter was, however, better, since it had a good registering apparatus and a good face rest.

With regard to McHardy's instrument, Dr. Dibble stated that it ought to be called Stevens' instrument, since he knew that McHardy had stolen it from Stevens.

The discussion was participated in by Drs. Thompson of Indianapolis, Coomes of Louisville, Reynolds of Louisville, Hazen of Iowa, Alt of St. Louis, Webster Fox of Philadelphia.

Wednesday, May 5.

On motion of Dr. Savage, Dr. Chisholm was then requested to make some remarks on iridectomy. He stated that he had got a statement from Dr. Michel, of this city, which had startled him, namely, that he did no longer bandage nor confine patients after iridectomy or extraction had been performed, and that his results were better than before. No statistics were brought on to prove the statements. The discussion brought about some rather severe criticisms on such action, and it seemed to be the feeling of the majority that to let well enough alone was wiser, until it could actually be proven, that something was really to be gained by such a procedure. Dr. Chisholm stated that he for one was going to test, whether the artificial photophobia, which is undoubtedly caused by the bandaging, could not be dispensed with without causing other disagreeable results by not bandaging such eyes.

Dr. Thompson, of Kansas City, reported a case of exophthalmus with no appreciable cause, although the orbit was under ether examined with probe and syringe.

Dr. Alt then showed to the section Dr. H. Culbertson's Prisoptometer for the detection of ametropia of all kinds.

In this instrument, as the name implies the refraction of two prisms placed together with their apices is made use of to detect the refractive condition of the eyes to be examined. In looking at a white circle at a given distance through the prisoptometer two circles will be seen which for the emmetropic eye are tangent. A myopic eye will see them overlapping, and a hypermetropic eye will see them apart. The glass which brings the circles into the first (tangent) position for the examined eye is the correcting glass for the ametropia of that eye. By means of this instrument astigmatism may also be determined, as by turning the prisms around the axis, the circles will be seen to travel around each other. If in any meridian there is hypermetropia or myopia, the circles will be apart or lap over in this meridian, and the correcting cylindrical glass can easily be found.

Dr. Alt stated that the few trials he had been able to give the instrument had convinced him of its usefulness, especially with children, and he thought he could recommend it. He further added that the instrument could be bought for $21 without and for $25 with stand of the Geneva Optical Company, Geneva, New York.

Next came a paper by Dr. Alt on some points in the management of trachoma. After reviewing the histology of the normal conjunctiva and detailing the histology of the trachomatous conjunctiva, the author stated, that the rules for the treatment should be either to bring about absorption of the trachomatous cell aggregations (follicles), or their evacuation. The former is accomplished by the stimulating treatment with sulphate of copper, yellow or red oxide of mercury, and other similarly act. ing chemicals. The second intention may be accomplished by different operative procedures, (puncture, excision, etc.,) and by the inoculation with the jequirity-poison. For the later stages of the affection iodol was recommended.

The paper was very amply and instructively discussed by most of those present.

The last paper was read by the president of the section. Dr. Eugene Smith, of Detroit. It referred to the successful transplanation of rabbit's conjunctiva into the conjunctival sac of a patient for the cure of symblepharon.

The discussion was cut short by the lateness of the hour.

Many of the members then examined and discussed the prisoptometer of Dr. Culbertson.

THURSDAY, MAY 6TH.

Dr. Murrell, of Little Rock, reported an interesting case of foreign body in the eye-ball. The discussion, which was very animated, and drifted into the subject of sympathetic ophthalmia and evisceration as a substitute for enucleation. Finally Dr. Frothingham, of Ann Arbor, moved something as follows: "That this section give it as their opinion that evisceration is an unsafe operation as regards sympathetic ophthalmia, and is not to be substituted for the latter." Drs. Alt, Thompson, Jackson, Hazen and several others protested against the adoption of such a motion, although thay all agreed with its sentiments. It was then laid on the table for one year.

Dr. Dickinson, of St. Louis, reported an interesting case of pemphigus of the eye.

Dr. Frothingham thereupon read a paper in which he showed that in his experience the instillation of cocaine had never caused any bad effects, and that he considered it the best anaesthetic in ophthalmic surgery.

Although several of those present had seen disagreeable general symptoms to follow the instillation of cocaine into the eyes and believed in a peculiar idiosyncrasy in some individuals, the author's ideas were concurred in by most of the members.

TRANSLATION.

THE JEQUIRITY POWDER.

(From the Revue clinique d' oculistique, March, 1886.)

BY DR. DUJARDIN, (LILLE).

The question of the use of jequirity, now almost three years old, is not yet solved. He would be sorely puzzled who, without any experience of his own, should try to form an opinion concerning the value of this drug from so many contradictory statements which he may find at every step in the abundant literature of this subject.

For the ones jequirity is a most dangerous remedy, the use of which ought not only to be abrogated, but even prohibited on account of the disasters which follow its therapeutic application. Vossius, (of Koenigsberg) absolutely condemns jequirity after a series of grave results. * * *

* * * It would be best to quickly forget jequirity if all experiments with it had let to as unhappy results as have those of the German surgeon. This not being the case, we will go to the partisans of jequirity, and here we find enthusiasts, especially Copper (of Brussels.) * * *

* * * We have ourselves very largely experimented with jequirity since the first few days after its introduction into the therapeutics of ocular affections. We had excellent opportunities in our department of the North, which is so full of people suffering from trachoma. In the *Journal des Sciences Médicales* of Lille, (June, 1883) we have related our first experiences which were undoubtedly happy ones, yet we did not allow ourselves to be carried to the unbounded enthusiasm of De Wecker who saw as certain a specific in jequirity against granular ophthalmia, as in quinine against malarial infection.

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1 See this Journal, Vol. II, No. 9, page 208.

We had found that the jequirity ophthalmia had an especial and powerful action in clearing up the pannus. Its effects on the granules in the conjunctiva in a great many cases appeared to us as almost *nil* * * *

* * * We said, therefore, in a general way that we were tempted to believe that jequirity acted well upon the granular keratitis and very little upon the granular conjunctivitis, especially where there was a certain degree of hypertrophy of the granulations (!) * * *

After a three years' experience we are not only not forced to renounce the conclusions drawn in our first paper, but on the contrary we must uphold them perfectly. Especially in the cases of old trachoma, when the granulations of the conjunctiva have begun to become atrophic, and where there is a discouraging corneal trouble, it is well to have recourse to jequirity as a heroic remedy. * * *

* * * But it is not necessary to reserve jequirity for these cases only. When there are combined with the pannus of the cornea, projecting granules in the conjunctiva, the jequirity may also be applied with great advantage; it will give back to the cornea a part of its transparency, but it will leave the granules about in the same state as they were before. The common caustics the sulphate of copper, the nitrate of silver, the hydrochlorate of mercury, will finish the work so happily begun with the aid of the jequirity, and by this mixed treatment the healing, otherwise so prolonged, will be materially shortened. This result is also a valuable one.

After having used at first the weak macerations of jequirity recommended by De Wecker, we have dared to use more concentrated preparations, five or six per cent, without, however, reaching ten per cent, as Coppez advised. * * *

* * * A serious objection to macerations of jequirity is their rapid disintegration in spite of all precautions, as the addition of boracic acid, salicylic acid, creosote, etc. * * *

* * * We have never seen any accident due to the use of this remedy, although we have treated more than one hundred cases with strong macerations of jequirity of six and even seven per cent. The success remained often behind our hopes,

but never have the eyes which were treated with jequirity suffered any damage from this agent.

It was, therefore, not this consideration which prompted us to use the jequirity powder, but the annoyance caused by having to prepare a fresh maceration for almost every patient, in order to get a good effect.

Instead of applying the powder directly to the conjunctiva, we prefer to dust it onto the inner surface of the lids with a camel's hair brush. The eye is then allowed to rest for a few minutes. The mechanical action of the powder causes some redness and lachrymation, but no pain worth mentioning. We usually apply it a second time, and even a third time, when we think it necessary to cause a violent inflammation. Before sending the patient to his home, we take the precaution to wipe all powder collected in the lower conjunctival tornix away with the finger, as a jequiritic eschara in this location might cause the formation of a symblepharon and even of a certain degree of entropium of the lower lid.

About thirty patients have been thus treated and all except the first few, have not been kept in the infirmary, but have been sent home with a simple treatment with sulphate of copper or nitrate of silver. The lack of sufficient space forced us to act in this way. Their stay in the hospital would of course, be preferable. * * *

* * * We have to state here, that the jequirity powder, dusted twice or three times into the eyes, as described above, within a quarter of an hour, develops a jequiritic inflammation, which is at least equal in intensity and in duration to the one resulting from the use of a five per cent maceration. In this we differ from A. Alt's opinion, and this difference is undoubtedly due to the fact, that we use the powder much more freely than he does, since he makes only one application and that even limited to one or the other lid. With these reservations we agree with the American surgeon in proclaiming the superiority of this new method of the application of jequirity. It seems to us that the powder is called upon to take the place of the macerations which have until now almost exclusively been used by those who had confidence in jequiritism.

CORRECTION.

Dr. Dudley S. Reynolds asks us to have the following correction made in his article "The prolate lens of Dr. Fox" April 1886, page 95:

14th line from below read

+ 11 D 60° + 12 D 35° + 15 D 150°

instead of + 11 D 60° + 15 D 35° + 16 D 150°

THE RATIONAL METHOD OF TREATING CATARACT PATIENTS TO THE EXCLUSION OF COMPRESSES, BANDAGES AND DARK ROOMS.

BY JULIAN J. CHISOLM, M. D., OF BALTIMORE, MD.

J. W., æt. 71, had cataract fully formed in left eye and forming in right. He was healthy, had good light perception in the cataractous eye, and was anxious to have sight restored.

The left lens was removed under the anaesthetic influence of a four per cent solution of the muriate of cocaine. Graefe's linear section with iridectomy upwards. After lens extraction patient counted fingers readily. The eye was washed with a biniodide of mercury solution one part to twenty thousand of water, then a few drops of a one per cent solution of atropia were applied and the eyes closed. Instead of the cloths, compresses and retaining bandages, the lid of each eye was kept closed by a piece of isinglass plaster 2½ inches long by 1½ inches wide. The piece of plaster made thoroughly pliant by being soaked in water, was spread over the lids from brow to cheek and carefully adjusted by stroking it with the rubber spoon, used for pressing out the lens. In a very few minutes this piece of diaphanous silk plaster was dry, and the patient was ready to walk from the operating table to his bed in the fourth story of the hospital. He was treated in the open ward and not in a dark room, on the reasonable belief that as the patient stood strong light before the cataract was removed, the closed lids, the substitute for the cataractous screen, ought to be a sufficient protection now. The room had blue curtains to exclude harsh light and for the comfort of other ward inmates. When in bed, the patient was told to seek the most comfortable position, lying on his back or on either side at his pleasure. He could get up for calls of nature, and sit up at meals, the only restriction being to keep his hands from the eyes and from the adhesive straps.

2d. day.—Patient reports a comfortable night. He has had no pain. The adhesive straps are smooth and hold on firmly. No treatment necessary.

3d. day.—Patient continues to improve; one eye feels as well as the other; he has had no discomfort of any kind. No treatment.

4th. day. Patient has been sitting up, feels well, straps holding nicely. No new adjustment necessary. A drop of a one per cent solution of atropia was put at the inner canthus. It found its way under the strap, along the border of the outspread lashes and into the eye. Not enough was put to displace the plaster, and what remained outside of the lid, was soon evaporated; no other treatment.

5th. day.—The patient has had no discomfort of any kind. He sleeps well and eats heartily. The adhesive straps are still smoothly adherent. If there had been any lachrymation, it had evaporated from the surface of the adhesive plaster as fast as it had exuded from the eye, and had, therefore, left no trace of its presence. As the patient has had no trouble whatever, during the past five days from the time of operation, the presumption was that the corneal wound had healed and that the lid support was no longer needed. The straps were removed from both eyes today. The eyes opened promptly, bearing the moderate light of the room without watering. A few drops of the four per cent solution of atropia were instilled into the eye and the patient left without protection. No smoked glasses.

6th. day. Patient was found walking about the ward, having had no inconvenience whatever from the exposure. The eye operated upon had some slight injection, but not enough to induce either photophobia or lachrymation. It seems as far advanced in convalescence, as the most successful cataract extractions, treated by compresses, bandages and dark rooms, three weeks after operation.

8th. day. Found the patient sitting at the window with curtain raised, cleaning his nails with his penknife. He could look out into the sunny street without any inconvenience, and is really ready for discharge from the hospital, but will be kept a few days longer for inspection only.

Since the 11th day of May, sixteen cataract extractions have been performed at the Presbyterian Eye and Ear Charity Hospital, on patients in public wards and in private rooms. With all of these, the new method was adopted. The sole dressings to the eyes were pieces of diaphanous isinglass silk plaster, large enough to extend from brow to cheek, and from one canthus to the other. These pieces were soaked in water and then thoroughly adjusted to the lid surfaces. This one dressing usually suffices for the entire treatment. If the straps become detached at the edges, as they did in some instances, they were replaced by fresh ones.

These patients were all operated upon in the operating room on the second floor of the hospital, and all under the anaesthetic influence of cocaine.

They walked to their rooms immediately after the operation, ascending to the third and fourth stories.

When put to bed, the only instruction to them was to leave the eye undisturbed.

No restrictions were put on their movements, nor as to diet.

One patient was found walking about on the second day. Several got out of bed on the third.

At no time were the rooms so dark that reading by others could not be enjoyed.

No water dressings were used.

The straps were finally removed on the 5th, or 6th. day.

All the patients bore the ordinary room light without photophobia or lachrymation, and without the protection of smoked glasses.

By the 7th. or 8th. days, patients were able to move about the house with eyes unprotected and with a degree of comfort unknown during the previous eight years existence of the hospital, and to the 582 patients from whom cataracts have been extracted up to the 11th. of May, 1886.

The revolution in the after treatment of cataract and iridectomy patients in this hospital is complete. From this time hence, all bandages, compresses and dark rooms will be among the things of the past, to be remembered only by the discomforts which they occasioned.

From my month's experience I am forced to the conviction that the hyperaemia, photophobia, lachrymation and painful weakness of eyes after cataract extraction, are largely, if not altogether, due to the methods of eye dressing in universal use, and are, therefore, induced by the treatment and not by the disease.

A patient applies for treatment with matured cataracts. He stands light perfectly well up to the moment of operation. While lying on the operating table, with cataract extracted, with pupil doubly enlarged by the iridectomy and with the strongest light in the face, he suffers no inconvenience and makes no complaint of its harshness. When the lids are closed, the amount of light straying through them into the eyes is about the same as that to which he was accustomed before the cataract was extracted. Which is the more reasonable mode of treatment, leave him in this natural condition, or at once plunge him into utter darkness by covering the eyes with bandages and compresses, and by putting him in a room so dark that even his attendants can not see to get about. When he emerges from this confinement at the end of eight or ten days, by the removal of the bandages, is it surprising that the eyes should weep, and that light should be painfully offensive? Try your good eyes without operation with the bandages, and see if they will not behave in a similar manner.

Then again as to bandaging. We do it, believing that the incised corneal wound requires support, which it undoubtedly does; but do we fulfil the indications by the methods we adopt? Heretofore I have thought so when I applied over each eye a square piece of soft wetted cloth, then a ball of raw elastic cotton which the supporting bandages would press equally on all parts of the wounded eyeball. Grant that this was all secured and that the proper support was obtained, when the patient leaves the operating room, what is the condition when he gets into bed? His movements upon the pillow draw necessarily, the bandage unequally toward the side pressed by the head. No bandage, however elastic and however nicely adjusted, can keep up at all times in the varied positions of the head, equable pressure on any one surface. Admit this, then we must acknowledge that there are times when the eye may be irregularly compressed, and that even before the lips of the corneal wound become adherent. Possibly this irregularity may even displace them after union has started, and therefore, might be positively detrimental.

Now, let us look at the new method of support, using natural means only. For how many years has the tarsal cartilage of the upper lid, thoroughly moulded to the rotundity of the eye ball, been its constant support. Let us make use of this eye splint which nature has especially prepared with its bandage all complete, in an orbicular palpebral muscle, which knows just how much tonic contraction is necessary to keep any part of the eye surface uniformly compressed. If a piece of isinglass plaster, having itself no perceptible weight, is made uniformly adherent to the surface of the lids, from brow to cheek, keeping the free edges of the lids in juxtaposition and ensuring a continuous muscular tonicity, then have we in reality found a perfect eye dressing for cataract patients. This dressing does not tramel any other part of the body than the part operated upon, and no movement of the patient can possibly disturb it. With this simple dressing the patient rolls about in bed at his pleasure without fear of injury to the eye.

The comfort to the patient is immense. The comfort to the attendant incalculable. There is no longer the dreaded darkness to the patient, nor the gloomy room to the attendant. We hear of no more stumbling over furniture nor complaints from friends that their eyes have been made weak by the confinement. Then when the straps are removed and the eyes are opened, the surgeon sees for himself the good strong eye, instead of hearing from the darkness the complaint of the patient, that tears are streaming down his face from the little light which his overbandaged eyes cannot now stand. From this point convalescence is rapid. In a very few days patients are ready for dismissal, and that without having used any protection spectacles. Still advise patients on leaving the hospital to use smoked glasses for the sunny streets. I have already had some to discard this advice as unnecessary. Two patients came for inspection to my office, four days after their dismissal from hospital, and two weeks after the cataract extraction operation, walking through the bright streets without any protection whatever.

Of the sixteen cases of cataract extraction treated by this new method, three of whom being very recently operated on are still with closed eyes under the adhesive straps. I have had the most gratifying results. Most of them have been brilliant illustrations of the efficacy of this simple treatment. In no case have I had the weeping eyes of a former experience, all of them standing the light well the day the adhesive strap was removed. It is a revolution complete in eye dressings, and experience has proved it to be a wise and very beneficial change, which must meet with universal acceptance, even if it does break up one of our long and most confirmed habits.

With cocaine as the local anaesthetic, and adhesive straps as the eye dressing, with light rooms in which friends can read for the entertainment of those operated upon, cataract patients will in the future have little to dread from pain or confinement.

ENUCLEATION IN PANOPHTHALMITIS, WITH A FATAL CASE

BY C. M. HOBBY, M. D., IOWA CITY, IA.

Undue reverence for the teaching of the great clinicians of the past, is not the most striking characteristic of American surgeons, yet at the last session of the American Medical Association, the suggestion that it was entirely safe to dispense with the traditional dark room after cataract operation, received but little favor, while there seemed to be an approach toward unity in the belief that enucleation in panophthalmitis was entirely safe, notwithstanding the hitherto generally accepted doctrine, that the danger to life under such conditions was much greater, than in enucleation under ordinary circumstances. It seems to the writer that the confinement of patients after operation, in dark, and necessarily unwholesome apartments, has no scientific explanation, while the anatomical relations of the diseased organ and the pathological process, in panophthalmitis, combine with the ripe experience of Von Graefe, and the occasional experience of many others, to teach that enucleation of the panophthalmitic eye, is accompanied with such an amount of risk to life, as to make the operation warrantable only, where the opportunity for gain is commensurate with the risk.

As this subject will doubtless be fully discussed at the next meeting of the American Medical Association, I will present, without comment, the notes of a case in point, kindly furnished by my friend, Dr. A. E. Rockey.

March 5th, 1886, P. B., age 45, German, stone mason. The patient's right eye had received an injury from a fragment of stone, in the spring of 1883, and had been troublesome since. During examination, while separating the swollen lids, the nuclear portion of the lens escaped, the condition was markedly one of panophthalmitis.

April 1st. Enucleation.

April 2d. Has felt well since the operation, no pain, appetite normal. 10 A. M., slight chill followed rapidly by thirst, fever nausea, vomiting and delirium. 1 P. M. Pulse, 145, temperature 103°.

April 3d. Delirium continued through the night and day, and during the evening of this day, he became comatose.

April 4th. Comatose. Death at 6 P. M.

EIGHT ENUCLEATIONS OF PANOPHTHALMITIC EYE-BALLS. NO ANTISEPSIS. NO MENINGITIS.

BY ADOLF ALT, M. D.

The foregoing paper by Dr. Hobby in connection with a number of papers on the subject of meningitis and death following the enucleation of eyes while suffering from purulent panophthalmitis, prompted me to look through my notes and to collect the cases of panophthalmitis in which I had enucleated such eyeballs. The number would probably have been a larger one, had I kept a record of all the enucleations I performed in various charitable institutions. Those here presented are from my private practice and reference is only made to cases in which I made the microscopical diagnosis of purulent panophthalmitis.

I have not employed any antiseptic agents in these cases, except plenty of water. After the operation, when all bleeding had stopped, I bandaged the eyes with absorbent cotton and a flannel bandage, exerting some pressure on the tissues of the orbit. This bandage was invariably left *in situ* for twenty-four hours, then changed once every twenty-four hours for three or four days. After that no further protection was employed.

Case I. G. B. C., æt. 29. The left eye had been injured four years previously, while he was at sea. What the injuring foreign body was, could not be made out exactly. He called it a "spark". Ever since he has been subject to intermittent inflammations, one attack of which, however, seems to have been gonorrhœal in character. During this latter attack sight was lost. A few days before consulting me, he had suddenly felt a severe pain in this eye, while sitting in the theater, and pain and inflammation had continuously grown worse since, and the fellow-eye began to show signs of sympathetic irritation (which later on developed into sympathetic iritis).

The left, blind, eye, when I saw him, showed chemosis, lachrymation, old scars of the cornea in which a new ulcerative process was going on. The anterior chamber was filled with pus, and no details of the interior of the eye could be detected. Tension was normal, the eyeball painfull to the touch.

I performed enucleation the day after this examination. No untoward symptom followed the operation, and the healing was undisturbed.

The histological examination proved this to be a case of purulent panophthalmitis, the whole uveal tract, the retina and optic papilla being affected.

Case II. J. A., 27 years of age. While chiselling iron, patient was struck by a foreign body in the right eye three days previously. The eye had at once become very badly inflamed and painful. There was a suppurating wound in the corneo-scleral region, inwards, covered by the chemotic conjunction. The lower half of the anterior chamber was filled with fibrinous pus, the iris was greenish and swollen, the pupil drawn towards the wound, the lens grayish. No reflex could be obtained from the fundus oculi.

I performed enucleation at once. The healing was perfectly gentle and undisturbed, although the wound reopened during the operation, and some of the pus was evacuated.

The histological examination showed a well developed purulent panophthalmitis due to a small piece of iron embedded partly in the vitreous body and partly in the retina and choroidea near the macula lutea.

Case III. Mrs. T. H., 25 years old. Patient had lost the right eye some years previously by a blennorrhœal conjuctivitis, probably of gonorrhœal origin. The blind and disfigured eye had given her no discomfort until within the last week, when it got suddenly and without any known cause very badly inflamed, and painful.

When I saw her there was considerable swelling of the lids and chemosis. The eyeball, which was staphylomatous, showed a whitish-yellow cornea with a central ulcer through which a calcarcous lens was falling forwards. No further details could be made out.

The following day patient decided to get rid of the annoyance this eye gave her, and I performed the enucleation the same day.

Nothing remarkable followed the operation, and the healing was perfectly normal.

Purulent panophthalmitis of a high degree was found on histological examination.

Case IV. H. Z., æt. 42. Patient had cataract in the right eye and pterygium on both eyes. While stooping down four days previously he had struck the right eye on a sharp bed-post and fallen down unconscious. When he awoke, the eye was soft, totally blind and painful, the lids began to swell and a severe inflammation gradually developed.

When I saw the patient, the lids were very much swollen, and there was a great deal of chemosis. There was a rent in the cornea extending on both sides into the sclerotic and through the ciliary body, with prolapse of the iris and the ciliary body. No ant. chamber. The eye was very painful. I snipped off the prolapsed portions of the uveal tract and ordered ice-applications etc. Yet, the inflammatory process did not seem to be in the least influenced by the treatment, on the twelfth day I enucleated the eyeball.

The histological examination showed the eye to be in a very active state of purulent panophthalmitis.

The healing was short and undisturbed.

Case V. Mrs. M. S., æt. 64. Patient was treated at the Female Hospital for some specific affection, when the left eye, which had been blinded by ulcerations due to trachoma became very badly inflamed and painful.

When I saw the patient, there was œdema of the lids, chemosis, ulcerative perforation of the cornea (which latter was leucomatous but now appeared yellowish). The pain was excruciating, and nothing seemed to be able to allay it. After having observed the case for a short period, I decided to enucleate the eyeball.

On histological examination it presented a uveal tract in a high state of purulent infiltration; the vitreous body also was one mass of pus.

No untoward symptoms followed the operation.

Case VI. J. R., 8 years old. Three weeks before I was consulted, the patient's right eye had been struck by the end of a piece of steel-wire which when cut, had rebounded with considerable force. Great pain and swelling of the lids had followed three days after the injury. This had been declared to be erysipelas and been treated accordingly. When I saw the patient there was immense swelling of the lids, chemosis and exophthalmus. The cornea was partially necrotic. The anterior chamber was filled with pus. In the inner upper ciliary region the sclerotic showed a round opening, as if punched through, which was filled with pus. No perception of light. Severe pain and head-ache.

Being afraid to enucleate at this stage, I kept the patient under close observation for six days, during which period the eye was kept continually cool with iced compresses. As soon as the most active stage of the purulent inflammation was over, I enucleated the eyeball. The enucleation was very difficult, since Tenon's capsule was perfectly obliterated by tough connective tissue. The healing was absolutely normal. The histological examination proved the case to be one of purulent panophthalmitis.

Case VII.—A. M., 53 years of age. Patient consulted me on account of attacks of pain in the left eye. This eye had been injured in his trade (stone cutting), and had become blind several years previously. There was no scar visible on the eye-ball, but in the anterior chamber lay the dislocated, shrunken and cataractous lens. The eye was considerably irritated, painful to the touch and spontaneously. V = 0. + T 1.

The next day I tried to remove the crystalline lens from the anterior chamber, but as soon as the patient came under the influence of chloroform, the lens disappeared in the vitreous body.

The day after, the lens was again in the anterior chamber and caused a renewed attack of pain. This time I tried to remove the lens from the eye, without an anæsthetic, and while the patient sat upright. After having made the counter-puncture, I allowed the aqueous humor to escape. Everything had gone well, when, just as I had completed my section, the patient squeezed the lids together in such a way that the speculum and a large quantity of vitreous body shot out of the eye. The lens fell back into the vitreous body, and the repeated attempts to reduce or snip off the prolapsed iris were frustrated by the totally unmanageable patient.

A purulent panophthalmitis resulted from this operative traumatism, and on the ninth day after it I was forced to enucleate the enormously painful eyeball.

The healing was quick and normal.

CASE VIII.—A. W. C., æt. 52, farmer. Patient's left eye had years previously been injured by a thorn, and had been almost blind. Three weeks previous to my seeing him he had taken cold in that eye and had since suffered excruciating pain with it, which was not relieved when the eye burst. When I saw him the cornea was almost all over superficially necrosed, a perforation in the lower outer quadrant was plugged by iris tissue. The anterior chamber was filled with pus. V. = $\frac{1}{\infty}$. —T. 1. There was some chemosis.

I performed enucleation the same afternoon under chloroform, although the patient was consumptive, and had a large cavern in the left lung. During the operation the eyeball burst, and a large quantity of pus was discharged.

No untoward symptoms followed the operation. The histological condition, as in the former cases, proved it to be a case of purulent panophthalmitis.

As it has long been stated that enucleation of a panophthalmitic eye-ball is dangerous to life, and as, of late, the number of cases in which meningitis, either fatal or nearly so, followed the operation, seems to have become rather frequent, I think, in order to come at the real truth, the experience of such enucleations which were not followed by any untoward symptom should also be reported. The old dogma that purulent panophthalmitis of one never led to any sympathetic affection of the fellow eye has, in the light of more recent researches, to be abandoned. Although I have in the foregoing only given cases from my own private practice, I know of a good many more cases from the practice of others since I had occasion to histologically examine the enucleated eyes. The possibility of danger in these cases cannot, of course, be denied, but it seems to me that this danger is at present being considerably overrated. It even seems to me that the danger of infection of the meninges and brain would be decidedly increased by allowing an eyeball filled with pus to remain in the orbit, and its lymphatics in continuity with those of the cranial cavity.

FOUR CASES OF GALEZOWSKI'S METHOD OF CATARACT EXTRACTION, THE LAST SLIGHTLY MODIFIED

BY H. CULBERTSON, M. D.,

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In January, 1883, in his journal, *Recueil D'Ophtalmologie*, p. 67, M. Galezowski announced his method of cataract extraction. At that date he had done sixty-four operations "without having to deplore any serious accident," and he states that he had from one-fourth to one-third better vision, than from Von Graefe's linear extraction.

In the same journal, 1885, p. 91, he reports as follows: that from a total of 486 cases of his extraction, without iridectomy, and performed at his public and private clinic, there were

437 cases completely successful,
37 " of iritis with obstruction of pupil,
13 " " phlegmons of the eye,
———
487 " total.

It will be noticed that there is an error in these results of one case excess, which can only be corrected by M. Galezowski.

He adds that there were

53 secondary cataracts requiring discission.
10 cases of prolapse of vitreous.
25 hernias of the iris.
—
88 cases, total.

Thus, the completely successful cases equal 89.8 per cent, and the phlegmons of the eye (supposed to be lost) amounted to 2.6 per cent. It is not stated how many of the complicated cases gained useful vision. Probably many did. In most of the cases of iritis, there were syphilitic antecedents present. Eight of the hernias of the iris were caused by the imprudence of the patient, and in one, the cause was due to an attack of epilepsy, and another was caused by delirium tremens.

In five cases of the phlegmon class, the cause was wounds or traumatisms from imprudence. In five the patients were glycosuric. Five cases of suppuration of the flap occurred, which was arrested in each by carbolic spray cast upon eye ball and wound.

His operation is performed as follows:

1st. The eyelids are separated with a speculum, and the eyeball is secured below the cornea by fixation forceps and the eye rolled downwards.

2nd. With a fine pointed narrow Von Graefe knife, puncture is made at the corneo-sclerotic junction 3 mm. above the horizontal diameter of the cornea.

3rd. The point of the knife is passed to the lower border of the previously dilated pupil, and the capsule is divided with it from below upwards to the upper limits of the pupil by depression of the handle of the instrument, the point describing the arc of a circle, the blade of the knife is not turned on its axis; then the counter-puncture is made opposite the point of puncture: (when this method was first proposed, the capsule was also incised horizontally before counter-puncturing).

4th. The incision is carried upwards and slightly forwards and completed wholly within the cornea, at two millimetres from the upper corneal margin.

5th. The speculum and forceps are withdrawn.

6th. The upper eyelid is elevated with the right little finger, and at the same time pressure is made upon the upper border of the sclerotic above the apex of the incision with the curette with the same hand.

7th. With the thumb of the left hand pressure is made, through the lower lid, upon the inferior border of the cornea. The lens escapes without difficulty.

8th. If the iris is within the wound, it is replaced with a silver stylet.

9th. Eserine is instilled.

10th. Weak carbolic solution is sprayed upon the eye ball for two minutes, and the eye is bandaged and carbolized dressings applied.

He lays great stress upon these carbolized dressings. In the *Recueil d'Ophtalmologie*, 1885, p. 577, he refers to the fact that he has caused to be made thin gelatine wafers impregnated with cocaine and mercuric bichloride, the former of which, I believe, he employs during the extraction. This wafer is placed over the corneal wound and cornea and front of eye ball beneath the eyelids, after the carbolic spraying. It remains, is slowly dissolved, and serves to keep the wound in apposition, and assists in closing the anterior chamber by its adhesion to surrounding parts, and also serves to constantly soothe and disinfect the eye.

He never excises the iris except for the following reasons: when it falls in front of the knife and is cut; in traumatic cataracts with synechia posterior; in case it covers the lens, like a cap, preventing its escape; and when it has been ruptured by the hard or voluminous lens.

He has done several extractions successfully by this plan, when there was present chronic inflammation of the lachrymal passages. I have imported some of these wafers, but decided not to use them, fearing changes might have taken place in the cocaine in them, which would retard the healing of the corneal wound or induce inflammation, and believing that *fresh solutions only* should be used of cocaine.

The following are some of the cases in which Galezowski's method has been employed, the last of which has been modified somewhat from the plan of that operation.

Case I. Mrs. N. D., aged 73 years, feeble but without visible disease, has double nuclear cataracts, the right mature. August 21st, 1883, I did Galezowski's operation on the right eye, without anaesthetic, (no cocaine known then), after freely dilating the pupil with hyoscine and duboisine, incising the capsule vertically and horizontally. The cataract came out easily, the incision adapted well and there was no enclavement of the iris. She had no unpleasant symptoms, but the wound healed slowly owing to her age and feebleness. Finally there was a slight synechia posterior to anterior capsule at the upper and inner region, but the pupil was nearly round and the capsule open at its center. She went home September 17th, and with proper glasses V. prox. $=$ D. $\frac{1.75}{0.20}$. and V. Rem. $=$ D $\frac{12.0}{0.75}$. Snellen. Her vision since, has much improved, as I learned last January, by tter.

Case II. Mrs. Mary V., aged, 52, has lenticular cataract of right eye of traumatic origin. May 19th, 1885, I did Galezowski's operation under cocaine, after dilating the pupil. The vertical incision of the capsule only was made. No pain was felt. The lens cortex was pasty, and some of this remained. Duboisine was used after the operation. May 29th, there is slight enclavement of the iris in the corneal wound in its upper and outer region, and the pupil is oval, from outwards above and obliquely downwards and inwards. The capsule is open. She went home on this day.

June 11th she returned. I opened the original wound, under cocaine, at its outer part, drew out the enclaved iris, cut it off with scissors, and got a rounded pupil. As the posterior capsule was clouded, I passed a fine iris hook through the corneal incision and obtained with it a central opening in the posterior capsule, revolving the instrument on its axis. Ice, anodynes, and full doses of antipyrine relieved the subsequent pain and fever so that on June 16th she was up, about and comfortable, and the following day she returned home.

July 23rd she came again. Her eye was well and pupil and capsule clear. With $+$ D 12.0 s $\overset{\frown}{\smile}$ $-$ D 1.25 cy. axis 90° Right V. Rem. $=$ D $\frac{4.0}{12.0}$: and with $+$ D 15.0 s $\overset{\frown}{\smile}$ $-$ D 1.25 cy. axis 90° V. Right. Prox. $=$ D $\frac{0.8}{0.33}$ Snellen. I have learned lately that her vision is still good.

Case III. Miss. S. J. I., æt. 40. Has mature lenticular cataract of right, (from a cow's horn hooking under superior orbital process) and immature cataract of left eye, the latter from striking her left brow against an object. Is subject to attacks of subacute rheumatism.

January 28th, 1885. Operated by Galezowski's method, modified, on right eye. Entered knife at corneal margin 3 mm. above horizontal diameter; after puncturing cut capsule vertically and horizontally with the point of knife; counter-punctured opposite to puncture-point; cut up in the sclero-corneal margin and completed the section in that junction and not at 2 mm. from it. For some reason, not stated in my notes, I did an upper iridectomy. The lens was then delivered by stroking the cornea from below upwards, and the fixation forceps and speculum were then removed, after the corners of the incision were cleared of iris with a silver stylet. The pupil was previously dilated with duboisine and the eye was anæsthetized with a four per cent. *fresh* solution of cocaine. She felt the operation, but the only painful part of it was during the iridectomy.

January 28th. Slight pain in eye, relieved with morph. sulph. gr iii., Hydr. chloral ʒij, croton chloral, ℈ij, syrup, ℥ij. S. Teaspoonful every hour until easy. Took two doses.

January 29th. Dressed eye again with cotton and bandage, and to-day applied, ext. belladon. and morphine salve, about temple, over brow, side nose and below lower lid, and dropped into eye, morning and evening, solution atropine sulph. gr.j. to aq. ℥. Some supra-orbital soreness and pain. Under this line of treatment, and applications of hot cotton pads over the bandages to eye, this rheumatism and irritation passed off slowly. There was no iritis.

February 16th. There is a moon shaped central opening in the anterior capsule.

March 17th. With + D 12.0 sp. ⌣ + D 2.25 cy. ax. 90° vision rem. = D $\frac{4.0}{9.0}$: and with + D 15.0 sp. ⌣ + D 2.25 cy. ax. 90° V. prox. = D $\frac{0.6}{0.20}$ Snellen. This case presents the essential features of M. Galezowski's operation, the laceration of the capsule with the point of the knife, but differs from it in the position of the incision, the iridectomy, the use of atropine and the non-employment of disinfectants, and the non-removal of forceps and speculum until the operation was completed. The case illustrates that an iridectomy can be done during such an operation and after such an incision, and that it was not necessary to introduce the cystotome to lacerate the capsule.

Case IV. Mr. Thomas P., aged 62 years, a glass-flattener by profession, and rather a delicate man. He has double cataracts non-traumatic, and the left was mature and was removed March

23, 1886, by Galezowski's method, modified somewhat. The crucial incision of the capsule was made. I did not remove the fixation forceps and speculum until the escape of the lens; pressure was made above the apex of the incision just back of the sclero-corneal junction with the curette, followed with gentle pressure with the unremoved forceps below in my right hand; and when the lens had engaged in the incision, the curette was withdrawn from above and used in stroking the cornea upwards. The speculum and forceps removed, the upper lid was elevated, the patient directed to look downwards, and the anterior chamber washed out with (warm 98.5°) a 2½ per cent solution of borracic acid, pure, in distilled water, which had been filtered. This was placed in a tin cup, to the bottom of which was attached a rubber tube, and the latter was secured to a Bowman's cataract suction apparatus, the cannula point of which had been cut off square and rounded smoothly. The cup, tube and instruments were well washed out with hot water, and then with some of the boric solution, and the cup was held by an assistant about two feet above the recumbent patient. The iris being in the wound the stop-off of the tube opened, the end of the canula was not at once introduced into the anterior chamber, but was held over the incision and near it. The flowing fluid caused the iris to reenter the anterior chamber, and then the canula was introduced while the wash was flowing within the area of the little column of water, but directed not towards the iris, but towards the inner surface of the cornea and down to opposite the level of apex of the cornea, the barrel of the canula resting against the incision of cornea gently. This brought out some cortex and caused the pupil to contract well. This done the canula was withdrawn, the angles of the incision were clear and the pupil round and free from capsule, when the eye was freely bathed in the conjunctival sac and over the cornea with M. Panas' disinfectant fluid, which is as follows:

℞ Hydr. biniodidi, grs. $\frac{7}{10}$.
Alcohol, ℥ v. (by weight).
Aquæ Dist. f. o j + $\frac{76}{100}$ pint.

Dissolve the mercury in the alcohol and add the water in a large bottle. Shake thoroughly for twelve hours and filter.

The solution of boric acid has been recommended by Wicherkiewicz, for the same purpose. See *Ophthalmic Review* Jan'y 1886, p. 18, from the *Klin. Montsbl. fuer Augenheilk.* Nov. 1885, p. 478. My apparatus is more simple, however, than his. But this gentleman like myself and others are indebted to W. A. McKeown who first used tepid water for this object. See *Ophthalmic Review*, vol. iv., page 345.

After bathing the eye with M. Panas' disinfecting fluid for half a minute, a FRESH SOLUTION of eserine was dropped into the conjunctival sac. The eye was then dressed with cotton and dry bandage, which were not removed for forty-eight hours. The eye was then opened and wound found united, and then the eye was again bandaged. The pupil was dilated before the operation with a solution of duboisine made as follows:

℞ Fl. ex. duboisine (Parke, Davis) ʒi. Add dialyzed iron ʒj M. and put into a bottle and shake at intervals for twelve hours. Then filter and add aqua distillata until a drop for the filtrate gives no color with a drop of nitric acid. Then evaporate on a water bath to ʒi; put into this a piece of camphor the size of a pea.

This is cheaper; the fluid extract costing $\$2\frac{16}{100}$ per lb., and its effects are better than any salt of duboisine I have used.

I used in this operation A FRESH SOLUTION of cocaine, fearing that *old* or even *recent* solutions might set up inflammation.

There was no reaction from the operation, and he might have gone home in a week had the weather permitted.

He left in two weeks, and will return soon to have his glasses adapted. He stated he did not feel the operation. No anæsthetic was given or mydriatics employed after the operation, and the eserine used but once. Another modification might be made in this operation. The incision was brought out 2 mm. from the upper border of the cornea, and was carried directly from the sclero-corneal junction upwards and out at 2 mm. from the cornea above. But the incision can, with propriety, be made to skirt the corneal junction in its entire extent, in order to secure greater vitality for the flap in that situation. This principle of varying the position of the incision, causing it to enter the sclero-corneal junction or even the sclerotic in the aged and feeble, has been urged by the elder Critchett and later by his son; while in the young and vigorous, they claim the incision may be wholly within the cornea, and thus, they hold, sloughing of cornea is avoided and cicatrization favored.

May 22, 1886. The patient returned to-day. The corneal wound has healed with accurate coaptation, and I am unable to detect any abnormal curvature of the cornea, and there is no astigmatism. The pupil is round, active and free from adhesions. The anterior capsule is freely open, but there is a slight clouding of the posterior capsule, but which, at present at least, does not demand operation. With + D 15.0 sp. V. Prox. = D $\frac{1.5}{1.0}$; and with + D 9.0 sp. V. Rem. = D $\frac{40}{24}$ Snellen.

I omitted to state that in the second case I washed out the anterior chamber with lukewarm filtered distilled water, thrown in gently with a hypodermic syringe, the canula of which was squared up and rounded smoothly at its distal end. It will be remembered that in that case there was also some clouding of the posterior capsule as well as in the last case, and it occurs to me if by possibility this could have been induced by the fluids introduced into the anterior and posterior chambers and reaching the posterior capsule, and inducing the clouding. But it is well known such a result is not uncommon after extractions in which irrigation was not thought of.

It may be added that I have done several other cases of this form of extraction, but as iridectomy was performed, I do not report them, although the results were good. I have not adopted this operation in other cases of extraction, hence I have only four cases of this class to report.

June 21, 1886. Since writing the above I find Mr. Galezowski, see *Recueil D'Ophtalmologie*, April No., 1886, p. 199, uses a four per cent solution of cocaine every two minutes for about ten minutes, and used one hour before the operation, and does not use any other mydriatic. He believes that this agent sometimes favors supperation of the corneal flaps especially in the aged, feeble and cachectic. He also speaks of this agent inducing a want of coaptation of the flap, which he claims is remedied by the application of his gelatine wafers over the corneal incision. He urges as little of this agent as will induce anaesthesia.

It is not impossible that if the cocaine is used *immediately* before the operation, and the duboisine or atropine several hours before, and that the washing out of the anterior and posterior chambers, and the conjunctival sac with disinfectants, will at least, diminish these risks from cocaine. It may be, too, that the hydrochloric acid of the muriate of cocaine can act unfavorably, and that the benzoate of cocaine would be less injurious than several parties have claimed this agent to be.

TWO CASES OF STRABISMUS WITH CHOROIDAL ATROPHY.

BY J. MORRISON RAY, M. D.

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In the *New York Medical Journal* of April 4th, 1885, Dr. F. C. Riley reported a case of hypermetropic convergent strabismus with choroidal atrophy, which he was able to correct by glasses. Since the appearance of this report, two cases, with similar complications, have come under my observation. A history of these cases and the results obtained from treatment are here presented.

CASE I. John M., aged 9 years, first came under my care in March, 1885. The father told me that the squint was first noticed when the child was one month old. He was a delicate child and often had spasms. He had passed through the ordeal of most of the acute diseases of childhood, and to these were attributed his small stature and delicate frame. When the squint was first noticed, one eye and then the other would deviate from the visual axis, but since his fourth year, the left has remained permanently strabismic. He has considerable difficulty at school in keeping up with his classes, and seems to be dull, or indifferent to such questions as are put to him.

On examination, I found convergent squint of the left eye. When the right is covered, the left moves outward and seems to fix centrally on the finger, as soon as the right is uncovered, the left again takes on the squint. V. R. $=\frac{20}{L}$. L$=\frac{8}{CC}$. As the day was dark and the boy indifferent to my questions, I was unable to tell whether any improvement was obtained by glasses. With the ophthalmoscope, the right eye appeared hypermetropic, and presented two small patches of choroidal atrophy, with irregular pigmented margins above and to the inner side of the disc. In the left eye there is a large plaque of choroid absent between the disc and the macular region, and encroaching somewhat upon the latter. In addition to this, are several smaller patches and pigmented spots scattered over the fundus, being especially marked on the nasal side of the disc. Atropia was ordered and the patient was instructed to return in two days. When he returned, the eyes were fully under the influence of the mydriatic, and there was no convergence. After some difficulty (due to the boy's stupidity), I found that in the right eye. the vision could be brought to $\frac{20}{XL}$, with $+ \frac{1}{9}$. In the left, there was doubtful improvement with $+ \frac{1}{9}$. Again, ophthalmoscopic examination was made with the hope that it would assist in determining the strength of the glass. He was eventually given $+ \frac{1}{9}$ for each eye. The atropia was ordered to be continued, proper glasses to be procured and the eyes to come from under the influence of the mydriatic with the glasses in position. I saw him again in one week. At this time he was wearing the glasses, and the pupils were beginning to assume their normal size. There was now no convergence. Vision was the same as when last noted. He came several times during the following month, and when last seen, there was parallelism. During the last few days I have made search for the boy, that I might see if any improvement in the acuity of vision had taken place, but his parents had moved from their former place of residence, and none of the neighbors could tell me where.

Case II.—Lulu P., aged 12 years, came to me from the interior of the state Oct. 18, 1885. She had had convergent strabismus since early childhood. For several years the squint was alternating, but, at this date, the right turns inwards. The child, though mentally bright, had considerable difficulty at school in consequence of her defect of sight. She had been the subject of severe headaches, which, of late, have become more frequent.

On examination V. L. $\frac{20}{LXX}$; V. R. $\frac{3}{CC}$. No improvement with glasses; ophthalmoscopic examination showed old choroiditis. In the right eye there was a large circular spot involving the macula, its edges are short cut, and it seems as if a piece of choroid had been punched out. There was only slight pigmentation of the edges; over the periphery of the fundus were several smaller spots of atrophic choroid. In the left eye only one spot denoting atrophy could be found, and this was low down in the margin of the field; besides these, were several pigmented spots without atrophy.

I ordered atropia, and, on the 20th, found that the left eye could be improved to $\frac{20}{L}$ with $+ \frac{1}{12}$. The right showed no improvement with glasses. The atropia seemed to lessen somewhat the angle of convergence. I ordered $+ \frac{1}{12}$ for each eye, to be worn constantly. She was seen at intervals until Dec. 8, but the squint showed no further improvement, and, as the father was anxious to have the defect corrected, I divided the internal rectus of the right eye under ether in the presence of Dr. John G. Cecil. Very little dissection of the conjunctiva was made, the opening being afterwards closed by a suture. The immediate effect seemed to be parallelism, but, on the following day, there was slight divergence. The atropia and glasses were now discontinued, and, on Dec. 23rd, the divergence had given place to slight convergence. And, as the child clamored for her glasses, she was allowed to commence their use again.

The father states at this writing that the severe headaches of which the child previously complained, have not recurred since she has been wearing the glasses. She says they give her great comfort, and protests strongly against any suggestion of their discontinuance.

If the destruction of the choroid had not been so extensive, I am inclined to believe that the result in this case would have been as good as in the first, since, when the atropia was used, there was considerable lessening of the deviation.

I am disposed to assume that the deviation in the first case was due to the error of refraction, the choroidal changes playing a secondary part; while in the second case the choroidal change was the prime factor. The error of refraction, however, did have some influence, as was shown by the diminution of the amount of convergence under a suspension of the accommodation.

In a single uncomplicated convergence I suggest to the patient the possibility of a cure by the proper adaptation of glasses, and in such cases correct the entire amount of ametropia, and order a continuance of the mydriatic until the glasses are properly adjusted.

ON THE HISTOLOGY OF TRACHOMA.[1]

BY ADOLF ALT, M. D.

[1] Extracts of a paper read before the St. Louis Microscopical Society.

Trachoma, granulated eyelids, being so frequent a disease, I thought it might be interesting to you to see some specimens of different cases of trachoma, which I have obtained from folds of conjunctiva, taken from the living subject.

As you know, Sattler thought he had found the trachoma-coccus, but had to take it back as well as his jequirity-bacillus. In my remarks no further reference will be made to the yet undiscovered parasite, which may, perhaps, be found to bring about the disease of the conjunctiva, known as trachoma, and will simply give you a few points on the histology of a trachomatous conjunctiva.

You all know that the normal conjunctiva consists of an epithelial coat, adenoid tissue (made up of a loose net-work of fibres, between which we find a number of lymphatic cells and the meshes of which are lymphatic spaces), and of a more fibrous layer where it is attached to the underlying tissues. The surface of the conjunctiva is not smooth, but shows numerous ridges and indentations. These are especially developed on the palpebral conjunctiva, and in the fornix.

The trachomatous conjunctiva is thickened, often to an immense degree. This, as you will see, is chiefly due to a diffuse infiltration of the adenoid tissue with lymphatic cells. For each and every one of these specimens you will see, however, that aside from the general diffuse infiltration of this tissue you have here and there, more or less numerous aggregations of round cells, which are round, oval or pear-shaped, and apparently like miliary lymphomata. These cell-aggregations are what has been considered the true characteristic of trachoma, and what has received the inappropriate name of trachoma-follicle. You will plainly see, that we have not to deal with a true follicle, and that this conglomeration of round-cells is not lying, so to speak, in a membranous sac. What might appear as such in some of the specimens, is simply the fibres of the adenoid tissue which have been pressed aside, and closely together, during the growth of this so-called follicle. The peripheral cells of this lymphoma-like aggregation are more densely packed than those that are centrally located, so that in specimens stained with hæmatoxyline you will see a dark peripheral ring. The cells themselves have nothing peculiar; they are simply lymphatic cells, and between them you will see a small amount of intercellular substance. The cells lying near and in the center sometimes appear larger than the peripheral ones.

It has been stated that the trachoma follicles contain no blood-vessels, and this has been urged as a proof, that we have actually to deal with a closed follicle. Nearly all of these specimens will, however, show you that the follicles are traversed by blood-vessels and sometimes by a great many. In the neighborhood of the follicles we often find enlarged lymph-spaces and canals.

During the progress of the disease the pressure of the cells may lead to the destruction of the epithelial layer covering the follicle, and to a spontaneous evacuation and healing in the manner of an abscess. Or the malnutrition, consequent upon the pressure, may probably cause the cells themselves to undergo a regressive metamorphosis (of such a process I have no specimens), or they may finally be absorbed.

These conditions, as detailed, are the same, only differing in degree, in the so-called follicular catarrh, the true trachoma, and where we have so-called solitary follicles.

Some of the specimens I have procured from rabbits which I inoculated with the secretions from the human trachomatous conjunctiva.

The minute ridges and indentations of the surface of the conjunctiva, I mentioned before, are, of course, all covered with an epithelial coat. During the progress of the disease and the irregular swelling of the conjunctiva, these indentations are displaced and distorted, and sometimes even large parts of them are cut off, and now appear buried in the depth of the tissue. These epthelial formations have, by a number of authors, been described as newly formed glands, and this process of new formation of glandular tissue has been taken for something characteristic of trachoma. Aside from the fact, that there is no new formation of glands, I may state, however, that the cells of the epithelial coat are, undoubtedly, stimulated to hypertrophy, and thus the epithelial tissue found in the depth is usually much thicker than the superficial layer of the conjunctiva.

Histologically trachoma is then characterized by lymphoma-like cell-aggregations within a conjunctiva diffusely infiltrated with round cells. This condition distinguishes trachoma fully from other affections of the conjunctiva.

In a paper read before the A. M. A., the author explained the therapeutic effects of some of the drugs used in the treatment of trachoma. He gave it as his opinion, that we had empirically found those methods of treatment the best which bring about an *evacuation* or the *absorption* of the follicle.

Among the remedies which bring about an evacuation is jequirity. Specimens taken from eyes treated with jequirity powder show that the inflammatory process destroys the epithelial cover, and causes it be cast off, thus artificially opening the follicles. This is undoubtedly the anatomical cause of the strange grayish appearance of the "doomed" follicles after the application of jequirity. When it is stated by Dujardin that jequirity is acting more on the "granular keratitis" than on the granular conjunctivitis[1], he is undoubtedly mistaken.

The author further stated that he practiced now frequently and with seemingly excellent result, the excision of the most prominent fold of the swollen conjunctiva. He could state that this little operation not only caused no deformity, but undoubtedly helped to shorten the process of healing by absorption.

In the last number of the *Archives of Ophthalmology*, our esteemed collaborator, Dr. Hotz, gives as his method of treatment the forcible expulsion of the contents of all follicles by pressing them out like comedones between the fingers or between the blades of a blunt iris forceps. The writer of this article has not yet tried this method, yet it seems to him to be correct in principle.

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[1] See translation this Journal, May, 1886, page 132.

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BADAL'S OPERATION, OR LACERATION OF THE INFRA-TROCHLEAR NERVE FOR THE RELIEF OF GLAUCOMA, ETC. WITH CASES.

BY J. S. PROUT, M. D., OF BROOKLYN, N. Y.

The laceration (*arrachement*) of the infra-trochlear nerve (*nerf nasal externe*) has been proposed by Badal, of Bordeaux,[1] for the relief of ciliary pain from various causes, among them any pathological condition that may induce hardness of the eyeball.

His reason for choosing this nerve is that it is the direct extension of that branch of the ophthalmic, the nasal, from which the eyeball receives its nervous supply, either as direct branches (*ciliary*) or through the ciliary ganglion (*ganglionic.*) He calls it the *external nasal*, but it is evident from his description that he refers to the infra-trochlear, as described by Gray and Allen, which escapes from the orbit just beneath the insertion of the pulley of the superior oblique muscle, receives a filament from the supra-trochlear and then divides into two sets of branches, one going to the superficial structures of the upper eyelid, the other supplying the skin at the root and sides of the nose, the caruncle, the lachrymal sac and the nasal duct. Horner in his Anatomy[1] says, "the nasal nerve, after the ethmoidal branch is sent off, is frequently called external nasal or *nervus infra-trochlearis.*"

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[1] Annales d'Oculistique, T. LXXXVIII (1882), p. 241, T. LXXXIX (1883) p. 231 and T. XC (1883) p. 89.

In order to find it we need only to lay the index finger, palmar surface forward, on the globe immediately below the brow, the extremity of the nail resting on the side of the nose: the upper half of the free margin of the nail will then cross its course as it emerges from the orbit. It and its accompanying arteriole may often be felt as a very small soft cord about half way between the pulley and the upper margin of the tendon of the orbicularis muscle. A curved incision three-fourths of an inch long, as indicated by the position of the finger-nail, will suffice for its exposure. It is small, soft, not readily distinguished from its surroundings and may easily be divided in the search for it, but fortunately it is not necessary to carefully isolate it. After having cut through the integument and the muscular layer the subjacent connective tissue may be separated by two strabismus hooks, one of which is then to be passed under the nerve and its accompanying arteriole from below upward, scraping the periosteum, *on which it lies*, as one takes up the tendon in a strabotomy. The tissue on the hook is lacerated by pulling with a very moderate degree of force directly forward. Half an inch of the nerve may thus be drawn out and afterward cut off. The hemorrhage from the ruptured arteriole is slight and easily controllable.

The wound is to be closed by sutures, and any simple dressing applied that will keep the lids quiet. Except cleanliness "antiseptic precautions" are not necessary. Healing is almost always by immediate union. In forty-eight hours the sutures may be removed. In some cases small tender nodules have remained after healing was complete.

Badal at first used chloroform, as he carefully isolated the nerve, but in his later operations he used no anæsthetic, as the time required is very short and the pain sharp only when the nerve is ruptured.

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[1] 8th edition, Philadelphia, 1851, Vol. p. 2, 440.

How the laceration of this nerve reacts on the nutrition and sensation of the eye, Badal does not attempt to explain, but refers to the well-known fact that such operations practised on the peri-orbital nerves do exert a therapeutic action not only against the symptom pain but also against vaso-motor and secretory disturbances. Besides, it does not matter to the surgeon whether it is by a direct action on the nerve or by a simple reflex action. It is not enough to *cut* the nerve, it must be *stretched and torn*, *lacerated*, so that the action, if a direct one on the tissue, may be propagated backward as far as possible in the line of the nasal nerve.

In his last paper Badal gives his clinical results based on eighteen patients with glaucomatous disease, on whom he lacerated the infra-trochlear nerve twenty times. They were not selected cases. At first iridectomy, sclerotomy and laceration were done somewhat indifferently, but the last-named operation was done on all his later cases. He calls especial attention to the fact, as one of its decided advantages, that this operation, as it does not attack the globe of the eye, is accepted much more willingly by the patient than iridectomy or sclerotomy. Four consented to an operation only on a formal promise that the eyeball should not be touched.

He says it has never aggravated the condition of the patient, and, without exception, the laceration of the nerve has relieved the pain, often immediately; some patients have suffered until the next day. An operation not involving the eyeball could not be expected to cause a rapid diminution of the tension, and in this particular it is inferior to sclerotomy or iridectomy, but in some cases the tension did diminish quite rapidly, in others slowly, in some no effect was produced. In cases where it has failed no better result has been obtained from iridectomy or sclerotomy done later. On the other hand in a number of cases where these operations had given no results, laceration had succeeded. Abadie has proposed to combine it with one or other of them, but Badal thinks that in severe cases, when a delay of only a few hours may be followed by total loss of vision, a paracentesis of the cornea will relieve the tension, which condition the laceration will then maintain. As far as he can judge it has a value in improving vision at least equal to the other operations.

The following is a condensed summary of the results of his twenty operations on eighteen patients (nearly all of whom were unpromising for any operation): *Pain* was relieved at once in ten, rapidly in one, gradually in five, not stated in four. *Tension* was relieved quickly in four, gradually in eight, not relieved in six, not stated in two. *Sight* had been long lost in seven, was improved in four, not stated in five.

At the meeting of the Ophthalmological Society of the United Kingdom of April 8th of this year, (Ophthalmic Review April 1886, p. 115), Mr. Spencer Watson reported that he had trephined the sclera in a case of hemorrhagic glaucoma. Mr. Brailey said that in such hopeless cases, the best treatment was to stretch the *supra*-trochlear nerve. Mr. McHardy spoke of the ease with which the *supra*-trochlear nerve can be found in the living subject. Mr. E. Browne in two cases had obtained no diminution of tension from stretching the *supra*-trochlear nerve.

As the *supra*-trochlear nerve is a branch of the *frontal*, and, consequently, much less directly connected with the nervous supply of the eyeball than the *infra*-trochlear and no more easily found or operated on, it is difficult to see why it should be chosen for *stretching* in preference to the latter.

I have performed laceration of the infra-trochlear nerve nine times on five patients, all so unpromising that the very small chances of success from any operation on the eyeball did not seem worth the risk that would be run. The first four operations were done under ether, the others without anæsthetic, except that in the ninth a solution of muriate of cocaine was injected at the location of the wound. In this case there was no complaint of pain. The third patient complained but little, but the fourth complained of sharp pain when the nerves were torn. In this my experience agrees with Badal's, who says that the operation is so slight and so quickly done that anæsthetics are unnecessary.

CASE. I Operations one and two. Mrs. McF. æt. 63, came to me March 14, 1884, for glaucoma simplex, of both eyes, complicated on the left side by chronic dacryocystitis. For more than a year vision had slowly failed in O. D. without pain in the eye, but with some pain and feeling of tension round orbit. O. D. has perception of light only. T. + 1, cornea clear, pupil reacts sluggishly with that of the other eye. O. S. V. + $\frac{1}{18}$ = $\frac{20}{\mathrm{XL}}$; T. + ? Visual field limited up and in. Ophthalmoscope: O. D. media clear, deep cupping of disc, spontaneous arterial pulsation; O. S. media clear, disc cupped, no pulsation. In each eye I saw appearances that made me suspect that hemorrhages had occurred. If it had not been for the dacryocystitis an iridectomy or sclerotomy on the left eye would perhaps have been followed by a favorable result, but she was averse to any operation on the eyeballs, in view of the fact that I could not promise a definite result. She, however, consented willingly to have the infra-trochlear nerves lacerated, and on the 17th, assisted by Dr. Joye, who kindly gave ether, I tore out each nerve. There was arterial bleeding, which was easily arrested. Two sutures were inserted on each side, and a greased rag laid on each wound and retained in position by a bandage. 20th. Removed stitches, wounds united, T. + in each eye. 25th. V. O. S. +$\frac{1}{20}$=$\frac{20}{\mathrm{XXX}}$. April 8th. O. S. V. +$\frac{1}{20}$=$\frac{20}{\mathrm{XXV}}$, she says the visual field is wider to inner side than before the operation. At the position of the left wound there is a small nodule about the size of a half-pea. June 10th. T. + in each eye. O. S. V. + $\frac{1}{20}$ = $\frac{20}{\mathrm{XX}}$. Oct. 29th. O. S. V. + $\frac{1}{20}$ = $\frac{20}{\mathrm{XL}}$, visual field gone above, much limited, in pupil sluggish. T.+1. O. D. sometimes painful. She thinks the dacryocystitis rather better since the operation. I advised a sclerotomy but it was declined. April 10th, 1885. Has much pain about the head, V. much impaired so that she cannot get about alone. T. + 2 each eye. The fluid accumulates in the sac as before. I instilled sol. eserine sulph. and prescribed some for her own use, which, however, did no good.

Case II. Operations three and four. G. C. J. æt. 32, Glaucoma simplex both, consulted me July 9th, 1883. He had had syphilis. Vision commenced to fail eighteen months ago in London when he saw Mr. Bader who told him he had chronic glaucoma and advised the use of eserine. Three months later iridectomy upward was done on each eye by my colleague Dr. A. Mathewson. He now counts fingers at two feet with each eye. T. +, media clear, no pain. Each disc deeply cupped. On April 5, 1884, at the Brooklyn Eye and Ear Hospital I lacerated each infra-trochlear nerve under ether. April 24th. Not perceptibly better. At the location of each wound there is a small nodule. Two days later he sailed for England: have not heard from him since.

After two good iridectomies had failed, no operation on either eyeball seemed proper and the laceration of the nerves was done as a last resort, of which it could only be promised that if it did no good no harm could be expected from it.

Case III. Operations five and six. Mrs. J. M. H. æt. about 75, consulted me Nov. 7th, 1880, for hæmorrhagic retinitis, O.S. Nine years before V. O. D. had been suddenly and permanently lost, from retinal hæmorrhage, as she was told at the time. Until two weeks ago the sight of O. S. had been good. I found V. O. S. $\frac{18}{50}$, not improved by glasses, external appearance normal, tension normal, pupil of normal size responded well to light. Media clear, emmetropic, physiological excavation of disc, small hæmorrhages all over posterior part of fundus. O. D. T. n., pupil reacted with that of O. S. Dark floating masses in the vitreous prevented satisfactory view of fundus. A month later V. O. S. was worse with T. +: there had been at times slight sharp sticking pains in this eye. In O. D. near lower margin of disc there was a small teleangiectasis in the retina. Sept. 29th, 1881. The visual field O. S. contracted in all directions, most *in* least *out.* Oct. 14th. With strong convex glass she could read large type. Nov. 30th, under ether, pupil well contracted by pilocarpine; did sclerotomy up, getting good incision without prolapse. As result there was some improvement of V. and T. became normal. Feb. 9th, 1885. Sight very poor, O. D. T. + 2, O. S. + 1, had pain running down nose on each side. April 24th, complained of much pain about O. S. May 11th, without ether, I lacerated each infra-trochlear nerve. May 27th. Eyes less painful, at each wound a small, firm, tender swelling. Sept. 28th. No pain since operations. V. as before, T. +. Dec. 22d. Some pain in eyes. March 30th, 1886. O. S. T. + 1. V. gradually failing, able to see persons moving about her.

The hæmorrhagic retinitis ran into glaucoma simplex which was temporarily benefitted by the sclerotomy. The Badal's operations relieved pain for a time but had no permanent effect on the glaucoma.

Case IV. Operations seven and eight. J. D. M. æt. 60, chronic glaucoma of both eyes, temporarily in Brooklyn, consulted me May 19th, 1884. He had overused his eyes, and his general health was poor. Sight had been failing in O. S. two years, in O. D. two months. There had been no pain in eyes but a feeling of tension round the orbits, and down the nose, the latter the more marked symptom. O. D. T. + 1, O. S. T. + 2? O. D. V. — $\frac{1}{16} = \frac{20}{\text{LXIV}}$. O. S. V. — $\frac{1}{18} = \frac{20}{\text{LXIV}}$. Visual field, O. D. normal to finger test, O. S. limited to inner side. Each disc was cupped. Under the use of eserine, T. became less but V. did not improve. He had chronic conjunctivitis, caused by retention of the tears in contact with the conjunctiva, which did not yield to treatment, and made me fearful of the result of any operation on the eyeballs. Oct. 1st. Reported by letter. O. D. counts fingers a few feet off; O. S. only perception of light. Dec. 16th. He returned to Brooklyn with hæmorrhagic glaucoma of right eye; T. + 1, counts fingers, visual field inner half gone. O. S. T. + 2, no perception of light, could get no view of fundus. On same day I did without anæsthetic Badal's operation on each side. He complained much of the pain when the nerves were torn. 23rd. Wounds healed at once. No improvement. Complains of pain across brow and down nose. T. as before. Did paracentesis O. D. under cocaine; after which the ball became soft. Next day it was again hard but became soft after reopening the paracentesis wound. This was again repeated next day; and then I did a sclerotomy, after which the pupil was central, but on the following day found a small prolapse of iris. No benefit followed. T. and pain persisted. Jan. 20th, 1886. T + 2. Complained of pain at the site of the left wound. On each side here was a small nodule. April 7th. Reported blind.

The general condition of this patient caused me to look upon the case as hopeless from the beginning, but it seemed proper to to give him the possible benefit of Badal's operation on each side. The complete relief of tension by the paracentesis made me hope that a sclerotomy might do some good.

Case V. Operation nine. Mrs. A. M. came under Dr. David Webster's care at Manhattan Eye and Ear Hospital, New York, on October 26th, 1885, for senile cataract O. D. General health, fair. O. S. was injured when five years old, now no perception of light, but being sensitive, enucleation was advised and declined. On Nov. 4th, a modified Graefe's extraction was done upward, the lens escaping easily and apparently entire. Some corticalis was afterwards found to have been left in the eye. The healing process was evidently complicated by sympathy with the other eye. Keratonyxis was done twice. Jan. 18th, 1886. V. with $+ \frac{1}{4} = \frac{20}{cc}$. March 1st. Counts fingers at one foot. O. S. was enucleated but O. D. did not improve. On 5th, an iridectomy downward was attempted. Vitreous followed the knife, the iris did not come forward and could not be seized or pulled out with either forceps or hook. Eserine which had been before used was continued giving some relief. The tension became very much increased, pain was constant and only relieved by repeated and large injections of morphia hypodermically. Perception of light only. On 12th, a paracentesis gave temporary relief. 15th. By invitation of Dr. Webster I lacerated the right infra-trochlear nerve, without anæsthetic, except that a few drops of solution of muriate of cocaine were injected at the location of the wound a few minutes before the operation. No complaint of pain was made. 16th. Patient did not sleep much during the night, but has had no pain in the eye. 19th. Eye has continued entirely comfortable, tension is reduced, eye less red and irritable, can see large objects. 22nd. Eye continues quiet. Eserine to be continued. Discharged.

To the above, for which I am indebted to Dr. A. C. Rogers, House Surgeon, Dr. Webster adds, March 29th "The result of your operation has been most gratifying. The pain which had been constant and only partially controlled by frequent hypodermics of morphine, was completely relieved from the first, and she has not taken an anodyne since. The tension had become nearly normal and an appreciable improvement in vision had occurred before she left the Hospital seven days after the operation."

April 12th. At the meeting of the New York Ophthalmological Society this subject was discussed. Dr. Webster reported that some pain had returned which was controlled by eserine; V. continued as before. Dr. W. O. Moore reported that he had done five, Dr. C. S. Bull three, Badal's operations with better results than the writer of this paper is yet able to report. June 14th. Dr. Webster reports that in accordance with a suggestion made at the last meeting of the New York Ophthalmological Society he tried Hancock's operation on Mrs. M. Her condition is worse, the ball will become atrophic.

From what precedes we may at least draw the following consions :

Badal's operation has been shown to deserve a trial, especially in cases unfit for operations on the eyeballs;

It cannot make matters worse as to the eyes;

Relief to pain, even if only temporary, is worth procuring at the cost of so slight an operation;

It is important that cases be recorded so that its value may be ascertained.

P. S.—In the Am. Jour. Med. Sciences, for July of this year, (p. 244), D. C. S. Bull refers to a paper on Badal's operation by Lagrange, (Archives d'Ophthal., Jan.-Feb., 1886), in which its advantages in the treatment of a large number of grave lesions of the eye are discussed. "It is particularly efficacious in releiving the element of pain, when the latter predominates over all the other symytoms.', He describes the method of performing it.

A CASE OF SUCCESSFUL LACERATION OF THE INFRA-TROCHLEAR NERVE — BADAL'S OPERATION.

BY DAVID WEBSTER, M. D., OF NEW YORK CITY.

March 26, 1886. Mr. B., aged 49, native of New York, farmer, married.

Patient thinks he never saw with his right eye. The globe is atrophied as from ophthalmia neonatorum. Its shrunken and sightless condition was first noticed when he was about two years old, at least so he has been informed. His left eye was near-sighted from his earliest recollection. When twenty-six years old, on account of failing sight, he consulted Dr. C. R. Agnew, who told him he had amaurosis from staphyloma. He visited Dr. Agnew on January 1st, 2nd and 3rd, and during the following May he lost all perception of light. Within the last few years he has had some "short seasons of pain" in the left eye, but they passed off without treatment. The present attack of inflammation has persisted since last October, varying, however, in its degree of painfulness. There is now no staphyloma of the cornea, but the eye is glaucomatous, with a degenerated cataract and pupillary adhesions. The eyeball is red, and the pain is so severe as to keep him awake nights.

Of course the operation which would have most effectually and certainly relieved Mr. B., was *enucleation*, and he was so informed. But he objected strongly to the removal of his eyeball on the ground of personal appearance. There remained iridectomy and the various other operations upon the eyeball, resorted to for glaucoma, and stretching of the infra-trochlear nerve. I proposed a trial of the latter. The patient consented, and the same day, in the presence of a large number of medical gentlemen, at the Manhattan Eye and Ear Hospital, I performed the operation. I operated as nearly as possible in the same manner in which I had seen Dr. J. S. Prout do the operation a short time previously. I had very little difficulty, in taking up with a strabismus hook, a small, white, cylindrical body, which seemed to be the nerve sought for. This I stretched until it broke, as I had seen Dr. Prout do, and, after closing the wound in the skin by sutures, permitted the patient to go to a friend's house, in Brooklyn, for the night. He called at the office the next day and I removed the stitches and let him go home to Newburgh, N. Y.

I did not hear from him again until June 3d, that is, about ten weeks after the operation. He then wrote me through his brother, "that the pain above and around the eye was mostly relieved, but the ball of the eye was quite painful up to a few weeks age, when it ceased almost entirely, and now he suffers no pain worth speaking of."

The operation seems to have done positive and permanent good in this case. Should the pain return, however, we have all the other operations to fall back on.

ON HEAT CONSIDERED AS THE RETINAL INTERMEDIATE OF LIGHT AND COLOR SENSATION.

BY L. WEBSTER FOX, M. D., AND GEO. M. GOULD, A. B.

Any one who brings to the study of Light and Color Perception any considerable training in physics and physiology, with an unbiased desire to explain the mystery that enshrouds these processes, must be astonished at the character and futility of the theories advanced to explain them. Let such an one read a score or more of the multitude of expositions and criticisms relating to the two theories that seem to occupy the greatest share of public attention, and if he has, apart from the mere facts incidentally learned, gained a single inch of advance into the comprehension of the manner and law of the transmutation of ethereal vibrations into color, we heartily congratulate him. In the language of an elder pious investigator, "The connection betwixt our ideas and the motions excited in the retina, optic nerve and sensorium, is unknown to us, and seems to depend entirely on the will of God."

It is not our purpose to enumerate the criticisms made, or possible to be made, of the Young-Helmholtz and of the Hering theories. That has been done *iterum atque iterum.* Of the first mentioned, Wundt pithily says: "Genauer betrachtet sagt jene Hypothese gar nichts Anderes als was schon im Mischungsgesetze enthalten ist, aber eine Erklærung des letzteren enthælt sie nicht; denn warum aus den drei Grundfarben alle Lichtempfindungen zusammengesetzt werden koennen, dies wird durch die drei Fasergattungen ebenso wenig begreiflich gemacht wie durch das Newton'sche Dreieck."[1]

A similar judgment is pronounced upon the Hering theory which, though to be preferred of the two, really succeeds in nothing more than in restating the problem in other terms.

These theories, although devised by practical color students, and in the full light of the nineteenth century methods of inductive science, seem to be entirely of the nature of deductions, superposed upon the facts, regardless whether they fit or not—much like the Hegalian metaphysic. Their vagueness excites suspicion at once. One is often in doubt whether the *location* of the process is situated in the retina, in the optic nerve or in the brain; the *Sehsubstanz* is said to extend from the retina to the brain, inclusive of both ends. The theory is made large enough to cover all possibilities of future discovery. The Roman's ox-hide can be made to cover many acres, if slit into a large enough network. Anatomical and physiological differentiations of function are ignored, and we wander in a maze of glittering generalities which seem oblivious of the elementary principles of physics and physiology.

But it is easy to be seen that the carefullest and largest minds are beginning to react against such *a priori* methods of procedure, and it is comforting to find that Wundt, the greatest living physiological psychologist, sets these theories aside and contents himself with the somewhat indefinite outlines of a theory that is not a mere figment of the imagination, but which in a large sense tallies with and is justified by the facts of ethereal vibration and physiological processes analogous to related phenomena in other functions of the body. The necessary indefiniteness of the subjoined epitome arises from the healthy endeavor to keep the theory within the bounds of fact, and if it does little more than state in succinct form the laws of these facts, such indefiniteness does not posit other and unknown mysteries for the known ones till confusion becomes infinitely worse confounded. Wundt is too trained a sportsman in the open fields of physics and physiology to adopt any shot-gun theory which, fired at the facts broadcast, might, by simple dispersion, strike some game however wide of the mark.

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[1] This hypothesis when scrutinized more closely contains nothing more than the law of the mixture of colors—no explanation of this law. It as little makes comprehensible why out of the three primary colors, all color-sensations can be produced through the mediation of the three kinds of nerve-fibres, as does the deltoid color-chart of Newton."

For the benefit of those readers who have not Wundt at hand we add a translation from the last edition in which he summarizes the elementary principles of his theory.

1. "Every retinal stimulation results in two different processes, a chromatic and an achromatic; the first is a consequent of the wave-length of light, and the second is likewise dependent on the same, in so far as relates to its relative strength, the maximum of its intensity being reached in the yellow space of the spectrum. Both movements with increased stimulus follow different laws, the achromatic process beginning with a weaker stimulus, but soon surpassing the chromatic in intensity. In the middle degrees of light stimulation the relative strength of the chromatic process increases, but falls behind the achromatic again under the more intense degrees.

2. The achromatic movement consists in an uniform photochemical process, whose intensity is in part dependent upon the above mentioned degree of the objective light stimulus, and in part upon the wave-length, reaching its maximum in yellow, and sinking toward both ends of the spectrum.

3. The chromatic movement consists in a multiform photochemical process, continuously changing with the wave-length, and therein presenting itself as an approximate periodical function of the wave-length, since the extreme differences of these produce approximately similar effects, while the effects of certain intermediately placed differences are opposed in such a way

that complete compensation is brought about as opposed phases of one and the same movement.

4. "Every photochemical process survives the stimulus for a time, and exhausts the sensibility of the sensory substance for that certain stimulus. The positive and similarly colored after-images are explained as the immediate results of this continuance of activity, whilst the negative and complementary after-images are explained by the consequent exhaustion."

So far Wundt, who plainly implies that the present state of inductive science does not justify any more decided specialization and detail as to the "photochemical process." In that word lies the *crux* of the question, and to solve the mystery hidden in it must remain the endeavor of every investigator. Our own aim in this paper is to ask if the term be not ill-chosen, and to propose another view, one, as we think, more in harmony with physics and more analogous to other physiological processes. It will be seen that we accept and stand upon the whole of the rest of Wundt's theory, since it but formulates in a general way the known facts of the results of the impact of ether-waves upon the retina. We only ask in substance if a more definite and exact and known term cannot be given for the unknown and indefinite one derived from photography.

The objection to the term, photochemical, is that, in the first place, there is little or no evidence that the result of ether-wave impact upon the retina is in any sense chemical. It implies a decomposition and a recomposition of retinal substance, which seems too gross a conception in view of the delicate structure and functions of the retina; and would necessitate an *amount of chemical work* done inconsistent with its limited powers and functions. The position and maximum elevation of the light curve of the spectrum as compared with the curves representing the ultra-red or dark heat waves, and the ultra-violet or actinic rays, indicate the same fact. The maximum elevation of the visible rays lies midway between the other two. That the ultra-red waves have no effect upon the receiving body of the retina, arises from several reasons; such rays are more varyingly and more wholly absorbed by the ever-present dust-clouds of the air, as also by all terrestial bodies, before the reflected rays reach the eye; they are two powerful producers of molecular activity; they would too strongly upset the delicate equilibrium of the retinal temperature. Lastly, they are too irrefrangible to be bent by the weak ocular media, their inclusion with the other rays would lead to pronounced circles of diffusion. The ultra-violet rays are shut out for similar reasons: their great dispersion through their high refrangibility, by the two powerful atmospheres of the sun and the earth; because of their weak kinetic energies; because of their too easy refrangibility by the media of the eye.

These facts point to an action mediate between the strong effects of radiant heat or dark rays, and the weak effects of the chemical rays. The eye during its formative period had not only a limited range of wave lengths left at its disposal by the greedy forces of absorption and dispersion,[1] but had out of these to choose such as were not too powerful or too weak, not too obstinate on the one hand or too willing on the other—too stubbornly or too easily refrangible—for its delicate and limited powers and purposes. These chosen correspond to the uses and objects of the mind, which desires only intimations through their otherwise neutral instrumentality, of the sizes, distances and qualities of objects. All these classes of waves are, of course, of one and the same nature, absolutely identical in quality; we call one class heat-rays, because the molecules of all bodies vibrate responsively under the wave-strokes of these frequencies; the retina secretes molecules responsive only to the medium lengths, and these are called light waves in conseqnence; the chemical rays act on the haloid salts of silver as a reducing agent, and are called after their chemical or actinic effects. The qualitative differences called heat, light and chemical action are produced by the receiving body, and result from the quantitative ones of the stimulus, from the varying kinetic energies of its different wave systems. Herein lies the physical origin of the shortness, less than one octave, of the "color-scale" as compared with the musical scale, a defect which is amply compensated for by the finer and richer perceptions of differences within the relatively short color octave.

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[1] We realize how great is our loss by this power of atmospheric absorption and dispersion, when we learn that the spectrum of the electric-arc in its ultra-violet region alone is from six to eight times as long as the whole visible spectrum, while that of the sun shine, owing to its absorption by the two atmospheres, is very short. What our color-sense might have been had *das Unbewusste* had these stimuli to choose from, is of course beyond our imagination, as well as beyond possibility. We could not have had these and the air too, though our air might have been freer from its several mile thick dust-shell. Even in its high altitudes the ultra-violet region of the spectrum is much brighter.

The term photo-chemical seems to be a general and large one, chosen, because of a certain analogy to the process taking place in the sensitive plate of the photographer's camera. It is true that Boll and Kühne succeeded in *fixing* an optogram in the eye of a rabbit, but as the macula contains no rhodopsin or visual purple, it is considered that vision is inexplainable by the formation of optograms in the rhodopsin. The discovery of this substance which seemed to promise much in explaining vision, seems, indeed, to have left the subject exactly where it stood before.

In place of *photochemical* we humbly suggest the term *thermal*, and would endow the retinal end organs with an extreme sensibility to slight degrees and changes of heat, resulting from the impact of ether waves of varying lengths and frequencies. We state in advance the results we have reached by considering the retinal function as an intermediate between the objective stimulous and the cerebral result, and as not endowed with any specific energy of its own:

1. The retinal mechanism, in the first place, simply effects a pro-rata reduction of the highly delicate and infinitely divided kinetic energies of the ether-wave stimuli into such relatively finite quantities and differences of quantities, as alone can effect physiological or rather nerve-forces. It is a translator from the language of the imponderable and infinite (comparatively speaking) to that of the finite and known of neural vibrations.

2. It moreover transfers these degrees of stimulation which it has rendered finite and recognizable, to the nerve-fibres whose function it is to convey them to the cerebral color and light producer.

3. This process of reduction and transfer is through the mediation of molecular activities aroused in the retinal receptive or-

gan by the stimulus, and perceived by the end-organs simply and only according to the height and degree of the aroused molecular activity.

4. The whole conception is based on these facts of physics: *a.* Ether waves can only impart their energies to the molecular constituents of matter, i. e., to bodies of like size or vibrating periods to those originating the waves; *b.* That the reception of such energy manifests itself primarily and always as increased vibratory activity of the receiving molecules; *c.* That our indication, register, and name for increased molecular activity is HEAT.

The essential nature of the transfer is a delicate perception of slight thermal differences.

It is thus seen that this conception of the process is a total discarding of the fallacy of the old-time belief in specific energies of the end-organs, on which the theories of Young, Helmholtz and Hering rest. It is certainly time that this "physiological echo of the philosophy of Kant," this endowing the end-organs or even the axis cylinders with specific powers and capacities, were given up. They are one and all only mechanical or proportional receivers and transmitters. It is beyond all question that it is in the brain that are eliminated the qualitative products called light, color, sound, etc., etc. The progress of the new psychology in pushing back these phenomena to where they belong, and where all research proves them to arise, is slowly but certainly taking place. The confounding of the two functions has been from time immemorial; the old gods die hard, but their death is inevitable.

We may briefly epitomize several concurrent facts and arguments in harmony with our view under the following heads:

I.—PHYSICAL.

Ethereal undulations are started into being by atomic or molecular blows upon the ether pressing about them, and this carries forward the vibrations, whose length or number per second, and whose height or amplitude, are identical with those of the striking molecules. Now the science of spectrum analysis rests upon the fact that these ether waves can only set up energy in matter by imparting to its particles vibrations like those of the original starters of the ethereal oscillations. The receiving molecules must be consonant or attuned to receive them, or, in other words, they must be of the same relative sizes and densities, capable of the same vibrational frequencies or potential energies. Only those parts of a body that are small and slight enough to be moved by the correspondingly delicate and imponderable energies of the ether wave can be affected by it. The "sympathetic" vibration of the piano string is set up by an aerial vibration started by another string whose vibratory period is consonant with that of the induced vibration of the second. But air-waves are ponderable quantities, while the potencies of ether waves, while as certainly positive, are of such infinite smallness, that only bodies of like smallness can be affected by them. In no other way can their effects be realized upon matter. In this way alone can they be supposed to initiate chemical change; the increase of the molecular agitation under their rythmic strokes increases till the molecules are swung beyond the restraining forces of chemical cohesion, just as a huge pendulum may be set vibrating by the timely recurrence, at periods consonant with the pendulum's beat, of a force of otherwise inappreciable delicacy. Spectrum analysis shows us the molecules of the sun's atmosphere, whose vibratory periods are consonant with those of the more heated, and so more actively vibrating molecules within his body, catching up the energies of the ether waves as they are passing outward past them, and thus causing the blank spaces or dark Fraunhofer lines of the sun's spectrum.

Now from the slowness of its propagation, and the powerfulness of its effect, we also perceive that the force we call nervous must be allied to the mechanical rather than to the atomic or imponderable order. It is a movement of masses rather than one of the atoms or molecules of masses. Since, therefore, ethereal cannot be changed into mechanical or nervous energy, except by the mediation of molecular energy, it follows that the primary retinal intermediate between ether waves and optic nerve tremors must be the increased molecular activity of some substance placed in or about the retinal end-organs. This increased molecular agitation we always call heat under any other circumstances, and by that name alone do we generalize these phenomena. If it be asked how heat or molecular activity is transformed into nerve-force, we can only say with the science of physiology, we do not know.

The necessity of such an interposited substance may be shown in another way, from a simple consideration of the numbers of the ether-waves. Our inability to conceive or form any faint fancy of the tremendous number of vibrations striking the retina in a second, is only parallelled by the same inability to realize the minuteness of force conveyed by each individual blow. The number of waves per second is equal to the total number of people in four or five hundred thousand such worlds as ours. Such an approach to infinity is only equalled by the completed products of intellection we call the divine reason, and can not be an ingredient of any subsidiary process of physiology or sensation. Meynart estimates the cerebral cells remaining for new impressions at 600,000,000. What have these to do with six hundred million millions? It becomes evident from such numbers and minuteness, that to produce anything like physiological effects, and especially prompt ones, this infinity must be brought within the limits of finite recognition, and processes.

The thermal registration of such infinite molecular activities offers the means of such a pro rata reduction process, and we get a glimpse of the character of this reduction by consideration of the fact that a single spectrum color of apparently uniform tint to the eye is, in reality, formed at one extremity by waves differing from those of the other extremity by so great a number as 5 or 10 millions of millions per second. Blue, for example, seems the same to the eye whether made up of 651 or 637 million of millions of vibrations per second. Green may vary from 585 to 578; yellow from 521 to 516, red from 440 to 435. These are certainly sweeping reductions, for our minds are yet in no way fitted to conceive of such numbers as five or ten billions. The physiological process is thus seen to be a crude and heavy reaction compared to the unimagined delicacy of the impinging forces constituting the stimulus. But with such massing together of numbers and forces we realize vividly that they are even yet too slight for anything except signs and indications. The energy of nerve transmission must be supplied by the self-contained forces of the organism. The light is not transmuted into nerve force. The slight increments of force derived from the light waves is spent in setting up molecular activity in a delicately-poised and sensitive matter, which only serves as a releasing mechanism, a starting of the nervous discharge and regulating its degree, as the electric current may be too weak to notice or may set off a discharge of tons of dynamite.

It may be of interest to note in passing that this intercalation of a molecular activity between the stimulus and the reaction accounts for the greater duration of time in the psychic (so-called) acts of sight, as compared with those of sound and touch-perception. It is otherwise incomprehensible that touch should produce psychic response sooner than the noble sense of sight, yet the relative periods are given as 0.167 second for sound, 0.213 for touch and 0.222 for sight. The loss is easily explained, as the time necessary to superinduce molecular activity by the fragile ether-waves in the receiving substance of the retina. It is not improbable that the time lost in this reduction process was a great difficulty to overcome by evolution and natural selection. Mr. Romanes says of the eyes of the medusæ that the interval between the stimulus and the response is so great that, were it any greater, the animal could hardly derive any benefit from their existence.

II.—PHYSIOLOGICAL.

Heat is therefore, not directly perceived by the nerves of the skin. That vibrational frequency of the ether we call heat, or sunlight, proceeding from molecular agitation of a "heated" body, strikes the skin, but only affects its nerves by throwing the skin and matter about the nerve end-organs in the skin, into increased, or sympathetic vibratile energy. These vibrations, and not those of the sunlight or ether, are perceived or taken up by the nerve end-organs.

Now there seems to be no reason or justification for the tendency of many minds to endow the different nerve systems of the body with utterly different natures and functions. Paul Bert grafted the tip end of a rat's tail into its back, cut it off at its former roots, and transmitted through it messages quite as well backward as they were formerly carried in the reverse direction.

The motor and sensory nerves may be made to exchange offices, and if "double conduction" is thus proved here, the principle of the uniformity of character of all nerve systems may be regarded as more than probable. The differences of result must consist primarily in the peculiar power and adaptability of the particular peripheral end-organs to receive and transmute the peculiar stimulus into the common language of the nerves, into neural tremors, homogeneous in all respects except in the ever varying intensities or degrees of stimulation. THE BRAIN DOES THE REST.

The reception of light waves by the retina and their transmutation into nerve messages by it must be of essentially the same nature as the reception of heat waves by the end-organs of the skin. Heat and light are different names for the same force. Both are one; both are ethereal undulations, though the slower are generally called heat, because they have a more pronounced sensational effect in that direction, yet light-waves are also and always heat waves, because all ethereal vibration is heat so long as heat is only definable as the energy of molecular or atomic motion, and so long as light-waves are the motions of ether. The logic is inexorable.

Temperature, then, is the unerring register of molecular activity. Double the amount of molecular motion and the resultant kinetic energy or heat, is proportionally increased. When the energy consequent upon any process is not guided by the environment into any particular form, it invariably manifests itself as heat; or in other words, when energy is not dissipated, it must be stored; and that storing is effected by increasing the molecular activity of the component parts of the body, or, as we commonly say, by augmenting the heat, or simply "heating" the body. We shall see later that the eye is jealously guarded against any dissipation of heat by its surrounding fat and capillaries.

We thus reach a point when we see that the retinal function need not be carried so far in the extreme of activity as that implied in the word chemical, and that the character of that function need not and cannot be essentially different from that of heat-perception. That the theory of the character of the retinal intermediation as essentially thermal, may be acceptable, we have only to make the retinal end-organs much more delicate and sensitive to slight changes and degrees of temperature than the ordinary sensory nerves of the skin. That with every degree of possible light-change there is also a temperature-change, there can be no doubt. Is such a refinement of heat-perception possible? We see no inobviable objection to such a belief. If we consider for a moment the temperature sense of the skin, we can but marvel at its delicacy. The tips of the fingers can distinguish through their coarse and thick dermal covering differences of so slight an amount as 0.2° to 0.16° R, and even to such extremes as that of 0.05° C., according to Lindemann. But in pathological conditions, and when the epidermis has been removed by burns, or vesicants, or herpes zoster, the exquisiteness of sensibility to temperature is not only immeasurable, but is unbelievable by those who have not so suffered.

But consider now the peculiarities and adaptations of the eye in reference to this matter of thermal sensibility. If many of its arrangements do not answer to this purpose, it is as if they did. Teleological arguments seem to stare at one immediately. The thick, warm comforting of inexhaustible orbital fat, certainly points to preservation of warmth. It is indeed a "bed," but it is certainly and more appositely a *warm* bed. The extraordinary, almost excessive, development and closeness of the meshwork of the chorio-capillaris, which wraps the whole retina about with its warm padding, also seems to correspond to the need for that high and uniform temperature, which would be demanded both for a registration of slight thermal differences, and a reinstatement of the normal after each disturbance or stimulation. That the periphery of the retina perceives colors less easily than the center may be due to its more exposed and less blanketed condition. Its subnormal temperature results in decreased sensitiveness.

To prove this the authors have applied a pencil of ice to the exposed sclerotic of the converged eye and then thrown colored images obliquely upon the cooled retina. Under the influence of cold a brilliant color can quickly be reduced to black, and as quickly brought back to its normal by the removal of the ice, or more speedily by the application of a heated sponge in place of the same. The sensitiveness and quickness of response, even of the peripheral portion of the retina, to these changes seemed to us to point to an interference with a process more delicate than ordinary physiological ones, and which would correspond to the enormously fine degrees of molecular activity which, as we believe, lie at the basis of color distinctions.

Our theory would suppose a highly sensitive and delicately poised receptive medium in a state of unstable equilibrium, normally responsive to ether vibrations between the frequencies of 392 millions of millions per second, and 757 millions of millions per second. Within these limits its molecules are varyingly and persistently capable of responding by their own vibrations to those of the impinging ether. The layer of pigment cells may be supposed to constitute or contain this receiving and reacting medium. Into this layer the long and blunt-pointed rods dip deeply, and doubtless serve as the transmitters of the raw material or nerve intensity corresponding to the sensation of simple light, or common day light, which is the most constant and pervasive of the stimuli, forming the background, as it were, of all light and color sensation. The delicately pointed cones do not extend into the substance so far, and by this fact and their shape and structure, plainly point to the function, more subtle and minute, of distinguishing those fine distinctions of difference, out of which color and tint are finally produced. This theory of the differentiation of function of the rods and cones, is borne out by many considerations, principal of which are these: The absence of rods from the macula, where color definition gives greater precision to vision of small objects than simple light could do; the absence of cones in nocturnal animals, who do not require any color perception, etc.

III.—CHROMATOLOGICAL

Sunlight is made up of the following proportions:

Parts	Estimated Wave Length.	Approximate Wave Frequency, Bill. per Sec.
54, Red	0.0007000 mm.	425.
140, Orange-Red	6347	475.
80, Orange	6094	500.

114, Orange-Yellow	5900	515.
54, Yellow	5713	525.
206, Greenish-Yellow	5500	535.
121, Yellowish-Green	5300	550.
134, Green and Blue-Green	5100	570.
32, Cyan Blue.	4900	600.
40, Blue	4760	625.
20, Ultra Marine and Blue Violet	4500	650.
5, Violet	4059	700.

According to Fraunhofer the comparative luminous values of the principal spectral lines and colors are as follows:

Red	B	32.
Orange	C	94.
Reddish-Yellow	D	640.
Yellow	D--E	1000.
Green	E.	480.
Blue-Green	F	170.
Blue		31.
Violet		5.6

From the last table we see that the curve of the light-producing energy of the colors reaches its maximum elevation in yellow, or between yellow and green, dropping upon either side to zero in extreme red and violet. This point corresponds to the mean wave length, and also the mean wave frequency of all the colors producing sunlight according to the first table. We see that the quantities of light above and below this dividing line of greenish yellow are about the same, so that the two parts of the spectrum may be considered complementary to each other, and we likewise find that when one color is complementary to another their mean wave length, if the proportionate intensities of the components be also considered, falls near the average wave-length of sunlight white, i. e., near 0.00053-4 mm. We therefore find the character of white changeless, however the intensity of illumination or quantity of light may vary. From the gray which is scarcely indistinguishable from black, on to the most dazzling brilliancy of the sun's glare, it is simply a question of a preservation of the proportions of the compound, whatever be the quantity of light. This is explained by considering the history of the eye. Diffuse daylight, since eyes began to be, has been their most persistent and continuous stimulus, overwhelming all other stimuli combined, in proportion and constancy. By day or night, whatever the circumstance, a combiation of the proportions of white light as given in the first table, has in ever varying strength been the stimulus of the eye. It is not, therefore, strange, but were it otherwise it would be so, that the eye has developed its most natural reaction and easiest response to such a stimulus: it is natural that the secretion, arrangement, and natural paths of the responsive retinal molecules should have become consonant with this peculiar and composite nature of the stimulus: it could not be otherwise. We consequently find that the subjective gray we perceive with closed and covered eyes (without pressure), and which is that low molecular activity arising from the retina's own heat and pressure, is the feeble activity of the molecules in the same manner of response as to feeble objective stimuli of the weak daylight we call night. Subjective color vision is rarer than various strengths of achromatic sensations. In traumatism vision is usually brilliant white, while by pressure on the ball and in cerebral disease all normal activity gives place to illogical mixtures of colors and of white in every degree and order. All this was to be supposed.

Achromatic luminous sensation is, under all variations of intensity, a preservation of relative proportions of stimuli. Colors arise when the proportions are modified and changed in any way. But, in this connection, three important facts must be borne in mind. 1. Color-perception cannot arise till a certain elevation of molecular activity has been reached in the retina, until either the color-producing waves have a certain strength of themselves, or until a general illumination by (weak) white has taken place. We should suppose *a priori*, that a certain elevation of molecular activity would be a prerequisite of a perception of changes in proportion. 2. All colors appear most saturated or pure at that degree of illumination we call diffuse daylight. This also was to be expected from the history of the eye, and from the supposition of our theory. The eye would, of course, learn best to perceive a change of proportions when acting under its most continuous and normal stimulus. The reaction to diffuse daylight being the normal and healthy degree of retinal molecular activity, it judges most accurately any departures from that standard precisely at the full of its normal response. 3. But increase the intensity of the stimulus producing color, and color is quickly remerged into neutral and brilliant white, which, with still increased intensity, changes in quantity but not in quality.

On any theory based upon the supposition of specific energies, these protean changes of intensity into quality and quality again back into intensity, must be inexplainable, twist and turn it however one please. But, if all these differences of quality are relegated to the differentiating center—of the brain—and the retinal mechanism be considered a responsive apparatus, always consonantly registering the height to which the molecular activity is aroused by the stimulus (which at last varies only in degree or intensity)—if we so face our facts about, light falls where before was mystery.

Another result of experiment is that different spectral colors require different periods of impact to bring forth the resultant color-sensation. On the supposition of specific energies why should a green nerve take a longer time to react than a blue one, and why either a longer than a red one? But, if green is produced only by a higher degree of activity of the retinal molecules, blue by lower intensity, and red by a still lower, then clearness again takes the place of darkness.

Another related fact also finds its explanation in the same way: that color and tint change by continuous observation. If continuously observed, pure colors may be merged into white; the whole spectrum may, in this way, become dichromic, blue and red alone remaining with a white interspace, or even these may fade into achromatic luminosity. This, in our view, bespeaks a cumulative effect of the repeated ether blows, which increase the retinal activity beyond the point of normal differentiation of color difference. The apparently correlated fact that after long-wearing of colored glasses, for example, blue, one is unable to distinguish blue colors, we think is due to cerebral rather than retinal fatigue.

After-images logically follow from the theory. That the retinal activity of the molecules must continue for a period after the cessation of the stimulus, would be a simple result of the laws of physics. As the molecular activity falls to the sensation of relative black, the sensations run through the scale of colors corresponding to the different levels of molecular agitation successively reached. It is especially consonant with our theory that the purest colored after-images are seen only after the extremest activity has been set up by brilliant white, and that no after-image is ever of a color of higher intensity than the causing stimulus; a stream cannot rise higher than its source.

Students acquainted with the heterogeneous mass of facts included under chromatological optics will, at once, see the range of applicability the theory has, but the whole field is in such an untilled and disorderly state that we forego further application for the present.

IV.—Psychological.

It may be said this view of the subject only pushes the mystery farther back, only relegates to the inscrutable processes of the coordinating center the real problem to be explained. To this accusation we shall only be too glad to plead guilty. If that much of definiteness could be reached, it would be well. It is far better to know just where the mystery is than to know not where it is; likewise it is better to know where it is not, than to know that it is everywhere. We are not vain enough to suppose that we have done more than to localize the mystery, to push it a step or or two farther back, and indicate the direction in which investigation might be prosecuted to bring the function of the retina into understandable processes analogous to those of other sensory organs. How, at last, the brain or the mind creates color and light from the raw material of neural tremors not unlike those of other nerve systems from which it eliminates very different products; how it makes of the one light, of another sound, of yet others, heat, muscular sensation, odor, taste—all this no witling would, at the present standpoint of science, attempt to intimate. It is not too much to say, no human intelligence has the faintest glimpse of an idea of the method. That the creation of light and color is absolutely and purely cerebral, there can be not the slightest hesitancy in affirming. Among a hundred other proofs is this striking one that two complementary colors thrown independently on identical spots of the two retinæ are (barring certain conditions and only apparent exceptions) perceived as the homogeneous resultant, white, by the fusing and unifying power of the mind. How the nerves transmit their messages is likewise mystery, but how they transmit degrees and differences of temperature is less a mystery than how they might transmit colors already formed, and of infinite variety. It is a plain fact that fine gradations and changes of thermal differences are recognizable and transmissible by them; and it is as certain that the only endowment we need to give them to explain their function from our stand point, is that of heightening and rendering their natural power of transmitting degrees of stimulus more delicate and precise. The simple fact of the specification of this or that end-organ as stimulated, the location of the position stimulated by the message of the connecting nerve-thread, is the basis of the fruitful theory of LOCAL SIGNS, whereby the mind, by habit and comparison, learns of the direction and position of the external object. By the power of the end-organs and of the nerves to perceive and transmit the exquisite differences of thermal stimulation, the mind likewise elaborates corresponding states of feeling we call color and light, as the psychical analogues of the variations of ethereal wave-length, frequency and amplitude.

V.—PATHOLOGICAL.

The semi-pathological facts and condition of color-blindness are often considered to be the test and touchstone of theories of color perception. How do we square our account? Our demands are once more of the most praiseworthy modesty; we simply "await the time in patience" till something more is learned, if it be possible, of the anatomical causes. Color-blindness may turn out to be either a result of retinal deficiency, or it may be purely cerebral, or both. If it is retinal it must certainly appear in time whenever an eye markedly color-blind, is secured for microscopical examination. So far this seems not to have been done, though there are some 4000 color-blind men in every million about us. One feels like ticketing his color-blind friend, or, perhaps, like putting to him the quizzical though pointed query of the medical student to the young lady with a remarkable peculiarity of the elbow-joint, "Where does your family bury?"

The differentiation of function, whereby the cones have become the intermediates of the more strictly color sensation, is, as we have observed, borne out in proof by the facts of comparative anatomy, and by many other more general considerations. Disuse is followed by atrophy, and if color-blindness is retinal, that is, if it is caused by the malformation, pathological condition, or absence of the cones, such facts must appear under the microscope. Whether some of our ancestors were, for example, the cave-men, and more particularly some household slaves or drudges of this tribe, who were never permitted to go forth by day—to whom, by the subtle laws of atavism, our color-blind neighbors hark back for their peculiarity—all this is, as yet, in the dim domain of speculation. More probably the color-blind, if we may again beg their pardon for the second calumniating inference, might go back to the night-howling apes in their genealogical tree. Unfortunately, we have as yet been unable to catch any of the present descendants of the night-howlers, however prevalent they are in modern civilization, and however gladly we would like to do so, in order to more fully investigate in the laboratory whether the two characteristics of color-blindness and nocturnal bellowing still go hand in hand!

Of course it is possible that the retinal defect, if such it be, may also reside in the pigment layer where the molecules, sympathetically responsive to vibrations of certain rapidities are wanting or deficient, or, from any imaginable cause, fail in functional activity.

It is more difficult to suppose the seat of the defect to be in faulty neural transmissson, yet even this might be. In either of the latter cases the morbid histological anatomy would not be shown by the microscope, certainly not in the former of the two.

We incline to think the *locus* of the functional failure will eventually be found to be cerebral; in which case any present attempt to reason about it would be quite as profitable as to discuss the famous Germanic question: *Utrum chimæra bombinans in vacuo posset comedere secundas intentiones?* It would be just as wise to repeat with old Porterfield the quaint, "It is the will of God," and there let the matter rest.

Resume.

Ethereal vibrations can only impart their energy to molecules of a like minuteness to those originating the vibratile energy. The instant and constant result of such imparted energy is the increase of molecular activity in the receiving body. Our name for that increased molecular activity, however minute and slight it be, is heat, which is the precise register of it in all ways and degrees. The retinal end-organs are not essentially different in function from those of the nerve-end organs of the temperature in other parts of the body, only more refined, more exposed, more pereipient of the exquisiteness of change. The pigmentary layer is the seat of the molecules, suspended in delicate poise of unstable equilibrium, whose function it is to respond sympathetically to the impinging ether waves, and whose answering vibratory activity is perceived by the rod-tips as the achromatic stimulation of white, or common day-light; and by the more delicately pointed and retracted cone-tips as those finer gradations of vibrational frequency, finally resulting in the cerebral product denominated color. The optic nerve tremors or transmissions are not unlike those of other nerve systems which transmit delicate differences and amplitudes of stimulus, and from which raw material, the cerebral artificer fashions the marvellous products, light and color with infinite cunning and by inscrutable methods.

That the feeling of light or color is specifically and utterly different from that of heat, gives us no pause or trouble. The whole range of retinal temperature change, within which and by which the infinitude of color-change must play, is probably far less than that of a single thermometric degree. That also creates no questioning astonishment in us. Students of physical optics are struck at every point of their investigation with the inexpressible complexity and infinite detail harmoniously resultant from the simplest and most single of causes. We, moreover, acknowledge the homeliness and simplicity of the present theory. The plain and barren phenomena of heat sensation seem, at first sight, to be beyond reach of analogy or likeness to those brilliant results of astounding subtlety and beauty, which we call light and color. But let us have a care of scorning simple and near-at-hand causes. It is by such, as we have at last learned, that Nature produces her most dazzling, most complex and far distant aims and results. The day of heaven-topping theories is happily past. In science as also in metaphysics, we are fast learning that the poet's verse is as well justified as in matters of every day life:

> "Our best things are nearest us,
> Lie close about our feet;
> It is the distant and the dim,
> That we are fain to greet."

To be acceptable to the cultivated inductive mind of this age, a theory must not contradict the evident laws of physics; it must not contradict the evident facts which it is seeking to explain; it must explain the unknown by analogy with the laws of the known; it must have the crowning merit of unity or simplicity, whence multiplicity of result proceeds logically from singleness of cause; it must, lastly, more properly localize the mystery yet remaining, and say "Here is light, there it is not." We modestly submit that previous theories, with the notable exception of that of our leader, Wundt, do not answer to these demands of the scientific spirit, and that our own, in a more or less perfect manner, does do so.

POSTSCRIPT.

Since the above article was written we have stumbled upon an article, previously overlooked, by Dr. Burnett, printed in the July, 1884, number of the *American Journal of the Medical Sciences.* This accomplished writer takes essentially the same ground as ourselves in regard to the fundamental nature of the retinal process. We do not wish "maledictions on him who discovers our good things before we did."

The most cursory examination of our articles will show that, though we arrive at the same result, it is by entirely independent roads and through a different country. And so, though at the time of writing, we had no knowledge that any other had struck upon the same thought, it gives us all the more confidence in the security of the result to find such a powerful ally.

Dr. Burnett's reference to Preyer's article in Pflüger's *Archiv*, sends us all to Preyer as the real author of the conception that the retinal function is a refined temperature-sense, though so far back as 1877 Pflüger had stated his belief in the *phylogenetischer Zusammengehærigkeit des Wærme-und Licht-sinns.* Of this, however, Preyer was as ignorant as we of Burnett's article.

It is a pity that Preyer should have adopted the semi-exploded doctrine of specific energies of the retina. His division of two neighboring axis cylinders each into two cones, each of which separately perceives only one of the four principal colors, each set uniting a "cold" and a "warm" color, is quite as perplexing as Young's three-fold, or Hering's triplicate polar divisions. The many analogies he draws between vision and the dermal temperature or tactile senses seem to us forced and beside the mark. In brief, there seemed little in it to repay the difficulty we had in securing its perusal.

On the other hand we were pleased to find Dr. Burnett throwing aside the whole machinery of specific energies, together with the theories of Young and Hering, built upon it.

We wish that the argument from embryology were as "conclusive" as Dr. Burnett inclines to think it. It is not quite true that the eye in vertebrates is formed from the skin and grows inwards to the brain. It would be true, if we could consider the sclerotic and the humors as the eye; but, functionally, these are only its adjuncts. The eye is *par excellence* the retina, and instead of this all-important organ growing inward from any dermal modifications it is found, embryologically, that it grows outward from the brain, and joins the epidermic helps. The greatly impressive fact is that the brain comes out to see, and that it comes the whole distance, and not that the skin goes in to tell the brain what it has undergone. Vision is of all the senses the most purely cerebral, or psychical in character. It is true that the argument may be rescued by Prof. Ray Lancaster's ingenious, interesting, but improbable supposition that the eye of the Ascidian larva, supposed to be the parent of all vertebrates, was situated on its brain, the rays of light penetrating with ease its transparent body.

Or, the fact might be emphasized that brain and skin are both differentiations of the external larval layer or epiblast, so that, in a sense, nerve-center and nerve-terminal, inner and outer, mind and matter are all one! But in this way we could, of course, go back to the original undifferentiated protoplasmic cell.

In a word, the eye's temperature-sense will bear out no such literal analogies to the skin's functions as Preyer would find, and the embryological argument would prove. The division of function was too far back; it must, as Genesis shows, have been the very next day after the "greater light" was placed in the heavens. About the only certain analogy which we can to-day draw between the two, is the very general one we have insisted on, of the perception of differences of molecular activities. But a cone with the pigment cells in front, and the complex machinery of numerous, not understood retinal layers behind, is a very different organ from the dermal corpuscles or end-bulbs of Pacini, Wagner, Krause or Merkel, and in the present state of our knowledge close analogies are drawn at a great hazard.

BLANKS FOR RECORDING LESIONS AND ANOMALIES OF THE FUNDUS.

BY EDWARD JACKSON, M. D.

Chief of the Eye Clinic in the Philadelphia Polyclinic.

Probably it has occurred to every ophthalmoscopist to wish that he certainly knew, whether an appearance now deemed of great significance, was, or was not, present at the time of an earlier examination; or that, to trace the progress of the case, he had the fundus of a month ago to compare with the fundus of to-day.

To some extent, such a wish must always be unavailing. Still, the habit of recording all the appearances noted, together with the thorough study of every fundus, to which the making of a complete record is the greatest aid, will leave less room for unavailing regret.

For anything like a full record of the state of an abnormal or anomalous fundus, a map is superior to any description in words, both in exactness and in the ease with which it can be made. Mapping is greatly facilitated by the establishment upon the projected map, of certain points and lines, to which other points and lines can be referred. I have, therefore, had blanks made, upon which such maps of the fundus may be drawn: and as the disk, fovea centralis and retinal vessels are the points and lines to which objects are referred on the fundus, these are represented on the blanks. As we never find two eyes with exactly the same distribution of retinal vessels, these diagrams can only serve as a foundation or outline upon which may readily be sketched the special features of each particular eye under inspection. In order that the lines of the diagram, not appropriate to the special case, may interfere as little as possible with the appearance of finished sketch, they have been printed in light ink, of a color that would be least obtrusive should a sketch in colors

be attempted. The larger arteries are represented by double lines; the veins by single broad lines.

Two slightly different blanks have been prepared, the one marked "right", the other "left". They may, by reversing, be used indifferently for either eye, if by so doing a diagram is secured which corresponds more nearly with the particular arrangement of vessels present, though reversal places the fovea somewhat too high.

The blanks are published by Queen & Co. of Philadelphia, and will be furnished with backs gummed ready for sticking in the case-book. A specimen accompanies this number of the JOURNAL.

PROTRACTED ACTION OF HYDROBROMATE OF HOMATROPINE IN SPASM OF THE ACCOMMODATION.

BY DR. DAVID COGGINS, SALEM; MASS.

May 15.—Mr. H., æt 30, a remarkably vigorous appearing man, has complained for some months of dimness of sight when playing billiards and when out driving, and occasionally he has had diplopia. Is accustomed to read and study till late at night. V. = Sn. 8. at 4. L. E. and 12. at 4. R. E. and vertical lines seen the best. A. = 8. D. with —. 75 D. = 4. at 4. *o. u.* and the lines all clear. Overcomes 12° prisms only, base out.

H. by shadow-test,—but I could not measure it. A drop of a recently prepared solution of hydrobromate of homatropine (1:60) was instilled in both eyes, (the patient having declined the use of atropine) and twice repeated at intervals of ten minutes, when there was complete paralysis of the accommodation. Sn. 4 was then readily read at 4. and with + 4. D. Sn. .50.

May 22.—Mr. H. was unable to read ordinary type until four days had elapsed after the accommodation was paralyzed. V. = 3 (in part) at 4., and .50 at .70.

My experience with homatropine has been limited, but probably its action on the ciliary muscle is very rarely so prolonged as it was in this instance.

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ONE HUNDRED AND TWENTY CASES OF ANÆMIC AND ATROPHIC CONDITION OF THE OPTIC AND RETINA.[1]

BY ADOLF ALT, M. D.

The paper by Dr. J. L. Minor, "On the Present Standing of Tobacco Amblyopia" (see this journal, Vol. III., No. 2. page 26), has prompted me to collect all cases of atrophic conditions of the optic nerve, seen by me during a period of over five years, and of which I had notes sufficient to arrive at some definite conclusions. The following Table I. gives one hundred and twenty cases in detail:

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[1] The continuation of this article will appear in the September number of this journal.

TABLE NO. I.

No.	Name and Age.	Cause.	Pupils.	Ophthalmoscopic appearance.	Color perception.	Visual field.	Visual acuity.	Treatment.	Time of Observation.	Result.	One Eye.	Both Eyes.	Remarks.
1	J. G. 50.	Alcohol and tobacco.		Both discs pale; arteries thread-like; large atropinic spot in choroid R. below yellow spot.	None.	Concentric limitation L. More pronounced on nasal side in R.	R. $^4/_{200}$ L. $^6/_{200}$	Abstinence, iod. potass. strychn. intern.	6 weeks.	None.		1	Vision has been failing gradually for 1 1-2 years. Does not change his habits.
2	Mrs. P. 52.	Probably central lesion (tumor?)	R. larger.	Disc R. very pale; arteries thread-like; veins enlarged; perivasculitis in upper half of retina.	Normal.	Contracted considerably in up- and downwards.	R. $^4/_{200}$	First strychnia subcut. Then const'nt current, and later arg. nitr.	2 months.	R. $^{20}/_{50}$	1		Strychnia was used until signs of poisoning appeared. Patient very nervous; suffered much from headache.
3	A. R. 55	Alcohol and tobacco.		Whitish discs.	Normal.	Central scotoma Both	$^{20}/_{70}$ Both.	Iod. pot. abstinence.	2 weeks.	None.		1	Does not change his habits.
4	C. H. W 28.	Injury to nervus opticus.		L. E. inner quadrant of disc very pale; arteries small; veins broad; some floating opacities in the vitrous.	Normal.	Upper and outer half wanting.	$^{20}/_{100}$		Seen in consultation.		1		Was shot into orbit.

5	Mrs. P. 52.	Probably central lesion. (tumor?)		Disc L. pale; veins broad, but not tortuous; arteries small.	Normal.	Normal.	$^{20}/_{50}$?	Constant current. Iod. pot.	4 weeks.	$^{20}/_{20}$	1		Patient died a few months later in spasms.
6	G. F. 53.	Syphilis and consequent central lesion.	Myosis, both.	L. white disc, R. whitish disc; blood vessels small.	Normal in R.	Contracted inwards and downwards.	R. $^{20}/_{50}$? L=0	Arg. nitr. constant current; pot. iod. Cold douche to spine.		R. $^{20}/_{30}$?		1	Had ischias 35 years ago; L. got blind 2 1-2 years ago; R. began to fail a year ago; syphilitic history; no patellar reflex; gastric crises.
7	Dr. A. S. 77.	Injury.		L. optic disc pale. Pigmentation of retina, especially in lower half.			$\frac{1}{\infty}$				1		Received injury to temple 7 years ago Had severe inflammation for 2 weeks. When examined by Dr. Noyes at that time had multiple retinal hæmorrhages.
8	J. H. 36.	Alcohol and tobacco.		R. whitish disc; arteries small. L. arteries small; retinal hæmorrhage below disc.	Cannot recognize yellow; calls green blue.		R. $^{6}/_{200}$? L. $^{20}/_{200}$	Abstinence pot. iod.	4 weeks.	R. $^{20}/_{70}$? L. $^{20}/_{50}$		1	No albumen. Heart normal.
9	F. G. 33.	Tobacco.		R. disc pale; arteries small; veins broad and partially tortuous. L. disc reddish; arteries small; veins tortuous.	Cannot recognize green.	Central scotoma both.	R. $^{20}/_{100}$? L. $^{20}/_{200}$	Abstinence pot. iod.	1 year.	R. $^{20}/_{30}$ L. $^{20}/_{20}$ Color perception normal.		1	

TABLE NO. 1.—*Continued.*

No.	*Name and Age.*	*Cause.*	*Pupils.*	*Ophthalmoscopic appearance.*	*Color perception.*	*Visual field.*	*Visual acuity.*	*Treatment*	*Time of observation.*	*Result.*	*One Eye.*	*Both Eyes.*	*Remarks.*
10	M. B. 30.	Probably central lesion (syphilis?)	Mydriasis L.	L. arteries very small; veins broad and tortuous; disc pale on inner half.		Very much contracted inward and downwards.	L. $^{1}/_{100}$	Potass. iod.	4 weeks.	None.	1		R. perfectly normal.
11	M. Mc. 43.	Alcohol and tobacco.		Discs white; arteries and veins very thin.	Cannot recognize green.	Restricted downw'ds and. Inwards in both. Central scotoma.	R. $^{12}/_{200}$ L. $^{15}/_{200}$	Abstinence, iron.	2 months.	None.		1	Dyspepsia potat. Does not change his habits.
12	R. K. 55.	Alcohol and tobacco.		Disc pale; arteries small; veins broad in L., small in R. abnormal pigmentation of choroid.	Cannot recognize yellow; green he calls blue.	Concentrically restricted. Both.	R. $^{20}/_{70}$ L. $^{20}/_{50}$	Abstin Pot. iod	2 months.	$^{20}/_{20}$? Both.		1	Has been a hard smoker for many years; took to drinking a few months ago; vision has been failing since.
13	J. K. 26.	Syphilis combined with alcohol and tobacco.					$^{20}/_{200}$ Both.	Pot. iod.; oleate of mercury.				1	Sent to hospital; result unknown.
14	Mrs. H. W 40.	Uterine affection Kopio-		Discs pale; arteries small; veins broad.		Contracted downwards and in-	R. $^{20}/_{70}$ L. $^{20}/_{200}$	Strychnia intern.; brom.	2 years.	Generally improved		1	Glaucoma developed later on.

		pia hysterica.				wards; central scotoma, both. (At times scintillating.		pot.					
15	J. D. K. 49.	Tobacco.	-	Outer half of discs perfectly white; veins broad; arteries very thin.		R. limited downwards, L. concentrically; centr. scotoma both	$^{20}/_{100}$?. Both	Strychn intern.; pot. iod. abstinence.	1 1-2 years.	Blindness.		1	Kept on smoking.
16	E. L. 39.	Alcohol and tobacco, perhaps syphilis.	Mydriasis both.	White discs.				Had been treated with strychnia, pot. iod. and electricity.	7 months	None.		1	Considerable headache. Strabismus divergens.
17	G. S. 53.	Alcohol and tobacco.		Whitish discs; arteries small.		R. restricted inwards; central scotoma, both.	R. $^{12}/_{200}$ L. $^{20}/_{200}$	Abstinence.; pot. iodid.	6 weeks.	$^{20}/_{200}$ Both.		1	Saloon-keeper.
18	W. S. 23.	Syphilis.		Whitish discs; arteries small; veins broad.			R. $^{20}/_{30}$? L. $^{1}/_{200}$	Pot. iod.	1 month.	None.		1	Infected 3 years previously; had iritis and bone affections.

TABLE NO. 1. *Continued.*

No.	*Name and Age.*	*Cause.*	*Pupils.*	*Ophthalmoscopic appearance.*	*Color perception.*	*Visual field.*	*Visual acuity.*	*Treatment.*	*Time of observation.*	*Result.*	*One Eye.*	*Both Eyes*	*Remarks.*
19	W. W. F. 29.	Alcohol and tobacco.	Mydriasis both.	R. whitish, L. reddish; arteries and veins thin in both.		Concentrically limited, and central scotoma, both.	R. $^{10}/_{200}$ L. $^{20}/_{200}$	Pot. iod., strychn., subcut. const. current; sublimate, abstinence; nitrite of amyl.	4 months.	R. $^{20}/_{200}$ L. $^{20}/_{100}$		1	
20	Miss J. A. 55.	Central lesion; (apoplexy.)		L. detachment of of lower half of retina; ant. cortical cataract; post. scleral staphyloma. R., white disc.			R=0 L. $M^1/_4$	Strychn. intern.			1		Had a paralytic stroke 2 years previously; R. got blind soon after.
21	Mrs. A. 52.	Unknown	Mydriasis R.; leucoma L.	R., lamellar cataract; white disc; small blood vessels.			R. 1-$2/_{200}$	Strychn. intern	2 months.	None.	1		Immature cataract had been removed from L. four years previously; severe inflammation; subsequently some kind of operation had been performed; total leucoma
22	J. Z. 28.	Alcohol and tobacco.		Reddish discs.			$^{20}/_{50}$ Both.	Abstin. strychnia intern.				1	Seen once only.
23	G. R. 44.	Insolation		Whitish discs; small arteries		Restricted inwards	R. $^{20}/_{70}$	Strychnia intern.		R. $^{20}/_{30}$		1	Came on suddenly after one day's

						and downward, both.	L. $^{20}/_{50}$			L. $^{20}/_{20}$			target practice in hot sun. Result stated by physician into whose hands the case came for further observation.
24	J E. 56.	Unknown		Whitish discs; small arteries L. beginning cataract.		Concentrically restricted; both central scotoma.	R. $^{20}/_{70}$ L. $^{20}/_{200}$	Strychn. subcut; Potass. iod.	1 month.	R. $^{20}/_{30}$ L. none.		1	Does neither drink nor smoke.
25	T. B. 45.	Probably syphilis.	L. circular synechia	L. disc pale; small arteries.		Constricted in all directions, especially on nasal side.	L. $^{20}/_{70}$		Seen in consultation.		1		+T but no excavation. Iridectomy and strychnia advised.
26	Mrs. R. 53.	Injury.		Discs pale; blood-vessels thin.	Red-green blind.		R. $^{12}/_{200}$ L. $^{20}/_{70}$?	Strychnia subcut.	Seen in consultation.			1	Was run over by a carriage, the wheels going over the head.
27	W. H. McN. 31.	Injury. Alcohol and tobacco.		Discs whitish; arteries very small.	Impaired.		R. $^{20}/_{50}$ L. $^{20}/_{70}$	Abstin; strychnia intern.	1 year.	None.		1	Was thrown out of an ice-boat and remained unconscious for several hours.
28	J. S. 45.	Alcohol.		Pale discs; blood-vessels thread-like.		Restricted inwards and downwards in both.	R. $^{8}/_{200}$ L $^{10}/_{200}$	Potass. iod.; strychnia intern. abstinence.	2 months.	$^{20}/_{50}$ Both.		1	Improved from the day strychnia was used. Has never used tobacco.

TABLE NO. 1. *Continued.*

No.	*Name and Age.*	*Cause.*	*Pupils.*	*Ophthalmoscopic Appearance.*	*Color perception.*	*Visual field*	*Visual acuity.*	*Treatment.*	*Time of observation.*	*Result.*	*One Eye.*	*Both Eyes*	*Remarks.*
29	H. M. 31.	Pressure from tumor of lachrymal gland; L.	L. acts sluggishly; medium wide.	Disc pale L.; arteries small; veins tortuous.		Concentrically limited L.	$^{20}/_{200}$	Removal of tumor.	3 months.	Field of vision nearly normal. Sight not improved.	1		Adenoma of lachrymal gland.
30	Mrs. B.H. 39.	Syphilis.		Total atrophy of L. Disc. Detachment of retina R.				Potass. iod.	Seen in consultation		1		
31	Dr. J. V. 42.	Alcohol and tobacco.		R. disc especially pale in outer half, grayish exudation around it; veins and arteries small. L. blood vessels very thin.		Restricted downwa's and inwar's; central scotomata.	R. $^{20}/_{200}$ L. $^{20}/_{100}$	Abstinence strychn;ia subcut.	6 months.	None.		1	Did not change his habits.
32	G. T C. 45.	Alcohol and tobacco.					Stated as almost blind when entering the Hospital	Strychn subcut.	4 weeks.	R. $^{20}/_{200}$ L. $^{20}/_{100}$		1	Seen at hospital; abstinence enforced

33	J. C. 68.	Central lesion; (softening of brain).	Unequal in size.	L., Disc pale; blood vessels small; periphery bloodless. R., post. scleral staphyloma all around disc; disc pale; blood-vessels thread-like.	Impaired.				Seen in consultation.			I	Removed to insane asylum 2 days after examination for acute mania.
34	H. C. 49	Unknown		Both discs pale; arteries especially thin.			$^{20}/_{50}$ Both.	Strychn. subcut.	1 month.	R. $^{20}/_{30}$ L. $^{20}/_{20}$		I	
35	F. McK. 32.	Tobacco.		Discs whitish; blood vessels, thin, especially R.		R. contracted inwards and downwards. L. normal.	R. $^{20}/_{200}$ L. $^{20}/_{20}$?	Strychnia intern. abstinence.	2 weeks.	R. $^{20}/_{100}$ L. $^{20}/_{20}$		I	Never drinks.
36	P. B. 31.	Doubtful.		Discs white; bloodvessels small.	Red-green blind.	Concentrically limited, especially in R.	$^{18}/_{200}$ Both.	Strychn. intern.	Seen only once.			I	
37	Mrs. J. B. 42	Probably syphilis.	R. larger than L.	R. disc very pale; main arterial branches barely visible. L. small arteries; upper portion of disc especially pale.		R. contracted to point of fixation. L. normal.	R. $\frac{1}{\infty}$ L. $^{20}/_{20}$?	Strychn. subcut. and pot. iod. at the same time internally.	3 weeks.	None.		I	R. had been blind for several days 2 years previously. Is said to have become blind again suddenly while patient milked a cow.

TABLE NO. 1 *Continued.*

No.	*Name and Age.*	*Cause.*	*Pupils.*	*Ophthalmoscopic appearance.*	*Color perception.*	*Visual field.*	*Visual acuity.*	*Treatment.*	*Time of observation.*	*Result.*	*One Eye.*	*Both Eyes*	*Remarks.*
38	W. Y. P 65.	Neuritis optica e causa ignota.		Discs whitish; arteries and veins rather tortuous both In L. distinct signs of former neuritis optica and floating opacities.	Impaired.		R. $^{20}/_{70}$ L. $^{20}/_{100}$	Strychnia intern; pot. iod. later on.	2 months.	R. $^{20}/_{40}$? L. unchanged.		1	Urine and heart normal
39	C. S. 58	Alcohol and tobacco.		Discs reddish; arteries small; veins broad.		R. scotoma.	$^{20}/_{200}$ Both	Abstinence; strychnia intern.	Seen once only			1	
40	B. S. D. 56.	Injury.		L. disc white; arteries threadlike veins broad.			V. L.=0		Seen once only.		1		L. temple was struck by a log; patient fell down insensible and was sick for 2 weeks after; when coming to found L. to be blind.
41	R. S. 52.	Alcohol and tobacco.		Whitish discs; small arteries.	Red-green blind.		R. $^{20}/_{70}$ L. $^{20}/_{100}$	Abstinence advised.	Seen once only.			1	Did not consent to abstain; refused treatment.
42	T. R. 33.	Alcohol and tobacco.		L. whitish disc; small bloodvessels.	Red-green blind L.	L. central scotoma.	R. $^{20}/_{50}$ L. $^{20}/_{100}$	Abstinence; pot. iod.	Seen once only.			1	Refused treatment.

43	Miss G. 15.	Cong'nit'l syphilis.		L. disc perfectly white.			0	Strychnia and ferrum intern.	Seen once only.		1		Very considerably emaciated.
44	E B. S. 56.	Alcohol and tobacco		Discs pale; arteries thin.			R. $^{15}/_{200}$ L. $^{14}/_{200}$	Abstinence; strychnia intern.	Seen once only.			1	Refused treatment.
45	J. M. K. 21.	Injury to L.; R. sympathetic. (?)	L. irregular; iridodialysis.	L., dislocation of lens, beginning cataract; pigmentation of retina, atrophy and pigmentation of disc. R. disc pale, in outer quadrant white; arteries very thin; veins partially broader than normal.	Red-green blind R.		R. $^{20}/_{50}$	Strychnia subcut.	3 weeks.	R. $^{20}/_{30}$		1	L. received an injury 13 years previously.
46	Mrs. J. B. 42.	Probably syphilis.		L. arteries small; disc whitish.			L. $^{20}/_{50}$	Strychnia subcut.	2 weeks.	L. $^{20}/_{30}$	1		
47	F. H. T. 44.	Alcohol.		Both discs white; blood vessels very thin.	Green-blind		$^{20}/_{40}$? Both.	Abstinence strychnia intern.				1	Two years previously had reddish discs and hyperæmia of retina; never used tobacco.
48	Mrs. S. C. H. 32.	Cholera Asiatica	R. mydriasis.	R. disc white. L. atrophic spots in choroid; iritis.			R=0		Seen in consultation.		1		R. got blind after attack of cholera 18 yrs. previously.

Table No. 1. *Continued*

No.	*Name and Age.*	*Cause.*	*Pupils.*	*Ophthalmoscopic appearance.*	*Color perception.*	*Visual field.*	*Visual acuity.*	*Treatment.*	*Time of observation.*	*Result.*	*One Eye.*	*Both Eyes*	*Remarks.*
49	S. W. 49.	Central lesion (multiple sclerosis).	Myosis both.	Whitish discs; small bloodvessels.			$^{20}/_{100}$? Both.		Seen in consultation.			1	Died soon after of his central lesion
50	J. C. W. 7.	Unknown		Discs very pale; some pigmentation around them; arteries and veins very thin; no pigment visible in choroid and epithelial layer; nystagmus.		Attempts at peripheral fixation.	$\frac{1}{\infty}$ Both	Pot. iod.	1 month.	None.		1	Father and mother were first cousins. Patient said to have lost vision only within last year after having suffered from erysipelas and balanitis.
51	L. R. 7.	Central lesion (cerebrospinal meningitis.	Mydriasis	White discs.			V=0		Seen in consultation.			1	
52	L. W. 41.	Alcohol and tobacco.		Whitish discs; small arteries.			R. $^{15}/_{200}$ L. $^{8}/_{200}$	Strychnia intern; abstinence; pot. iod. sublimate.	7 months.	R. $^{20}/_{30}$ L. $^{8}/_{200}$		1	Saloon-keepor.
53	A. B 32	Alcohol and tobacco.		Discs pale; bloodvessels small.		Central scotoma, both	R. $^{20}/_{30}$ L. $^{20}/_{50}$	Strychnia intern.	Seen once only.			1	Saloon-keeper; refused abstinence.

54	G S. 48.	Central lesion (tabes dorsalis) Was a hard drinker formerly	Myosis both.	Discs pale; arteries small.		Concentrically limited, both.	R. $^{20}/_{30}$ L. $^{20}/_{20}$?		Seen in consultation.			1	
55	V. K. 42.	Insolation also hard smoker.		Whitish discs.			R. $^{15}/_{200}$ L. $^{3}/_{200}$	Potass. bromid. and strychn. intern.	2 weeks.	R. $^{20}/_{200}$ L, $^{6}/_{200}$		1	Vision was impaired immediately after the sunstroke.
56	F. S. 46.	Alcohol and tobacco.		Whitish discs.	Red blind.	Central scotoma, both.	$^{20}/_{200}$ Both.	Abstinence; strychnia intern.	Seen in consultation.			1	R. temple had been injured by a fall.
57	Mrs. A. S. 30.	Probably cosmetics.		Discs pale; arteries and veins small.			$^{20}/_{30}$? Both.	Strychnia and iron; Potass iod.	6 weeks.	$^{20}/_{20}$ Both.		1	Improved when having discontinued cosmetics for several weeks.
58	D. A. W. 72.	Old age.		White discs; small bloodvessels.			R. $\frac{1}{\infty}$ L. $^{20}/_{200}$	Stimulants; strychnia intern.	2 years.	Blindness.		1	Otherwise apparently healthy.
59	T B. 53.	Alcohol and tobacco.		Pale discs.		Central scotomata.	$^{20}/_{40}$ Both.	Abstinence; strychnia intern.	Seen once only.			1	

TABLE No. 1. *Continued.*

No.	*Name and Age.*	*Cause*	*Pupils*	*Ophthalmoscopic appearance.*	*Color perception.*	*Vioual field.*	*Visual acuity*	*Treatment.*	*Time of observation.*	*Result.*	*One Eye.*	*Both Eyes*	*Remarks.*
60	Miss E S 15.	Doubtful	Mydriasis both.	Discs reddish; retinal vessels very thin.	None.		$\frac{1}{\infty}$ Both.	Strychnia intern.; pot. iod.; warm sitz baths.	2 months.			1	Said to have always been "shortsighted;" blindness came on L. six months ago, R. since. Menses have been suppressed by some unknown cause.
61	Miss M.F. 16.	General anæmia.		L. disc pale; arteries and veins small.			L. $^{3}/_{200}$	Strychnia subcut.	3 weeks.	L. $^{20}/_{200}$	1		Was operated upon for convergent strabismus three years previously, L. was then already amblyopic. (V=$^{20}/_{200}$.)
62	H H. K. 58.	Alcohol and tobacco.		Pale discs.	Impaired.		R. $^{12}/_{200}$ L. $^{18}/_{200}$	Abstinence; strychnia intern.	Seen once only.			1	
63	Dr. H. 79.	Old age (formerly heavy drinker.)	Sluggish.	L., white disc.			L. $^{20}/_{100}$	Strychnia intern. and stimul'nts	Off and on for six months.	Increasing failure.	1		R. operated upon for inflammatory glaucoma 2 years previously. Later on paralysis of oculomotor nerve.
64	J. W 34.	Unknown	L., mydriasis.	R., whitish disc. L., white disc.	Red-green blind.		R. $^{20}/_{200}$ L. $\frac{1}{\infty}$	Strychnia subcut.; constant	3 months.	Increasing failure.		1	

								current pot. iod. sublimate					
65	A R. 30.	Injury.		L disc white.		Concentrically limited.	L. $^{20}/_{200}$	Strychnia intern.	2 months.	None.	1		Fell down an elevator shaft and received fracture of as frontis; considerable hæmorrhage into orbit.
66	P. L. 38.	Alcohol and tobacco.		Pale discs.			R. $^{20}/_{50}$ L. $^{20}/_{100}$	Strychnia intern; abstinence.	2 months.	R. $^{20}/_{40}$ L. $^{20}/_{70}$		1	
67	N. W. 18.	Central lesion (epilepsy).	Middle wide inactive.	Discs pale; bloodvessels thin, especially L.			R. $^{20}/_{50}$ L=0.	Strychnia intern.	Seen in consultation.			1	L. got blind 4 months ago.
68	S. L. H. 63.	Alcohol and tobacco.		Discs pale; arteries very small.			R. $^{20}/_{100}$ L. $^{20}/_{70}$	Abstinence; strychnia intern.	Seen in consultation.			1	Continues his bad habits.
69	C. S 37	Alcohol and tobacco.		Post. scleral staphyloma. L disc pale; arteries thin.		Central scotoma R.	R. $^{20}/_{50}$ L. $^{8}/_{200}$	Abstinence advised.	Seen once only.			1	Saloon-keeper. L. suddenly got almost blind after a drinking debauch.
70	Mrs. D.R. 49.	nknown		Outer half of discs very white; arteries thin; veins broader than normal.			R. $^{20}/_{50}$ L. $^{20}/_{40}$		Seen once only.			1	Refuses treatment.

THE TREATMENT OF DETACHMENT OF THE RETINA WITHOUT OPERATION, WITH A CASE.

BY FRANK B. EATON, M. D.,
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Undoubtedly the varieties of puncture-operations for detached retina, now advocated by a few ophthalmologists of reputation, are not popular with the mass of surgeons in any land. A calm review of the writings published on the subject during the past ten years, and of the discussions in some of the ophthalmological societies, will convince any one that this is the fact; and the conclusion arrived at, instead of intimidating the oculist should lead him to seek new lines of clinical investigation and treatment. In 1882, Professor C. Schweigger published a paper entitled, "Observations on Detachment of the Retina,"* in which, while he did not advocate the abandonment of puncture, he laid particular stress upon diaphoretic after-treatment, and summed up his general plan of treatment thus:

"Provided, the retina be not perforated spontaneously, I consider early puncture, in connection with a regular diaphoretic treatment the most rational course, and the chances the greater the smaller the detachment. For several years I have preferred, for the diaphoretic treatment, sodium salicylate to pilocarpine, which produces many unpleasant symptoms. I give 2.00 grams in 0.5 doses [7½ grains] every ten minutes, and have the patient wrapped in woollen blankets; the diaphoresis to be continued for several hours, during which the patient may take weak tea."†

It is unnecessary to state that the great majority of cases of detachment apply for treatment, when early puncture is out of the question, and I freely confess that I have had no experience with it as a means of treatment.

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* Archives of Ophthalmology, Vol. XI. p. 451. † Ibidp. 453.

But so marked and rapid an improvement did I accomplish in a case of marked detachment with copious subretinal effusion by vigorous diaphoresis alone, that the question arose in my mind, as to whether this form of treatment in properly selected cases had been fairly tried. In the case I here give, it will be noticed that I departed somewhat from Schweigger's plan, and brought into requisition *with* sodium salicylate the Turkish bath. The case is as follows:

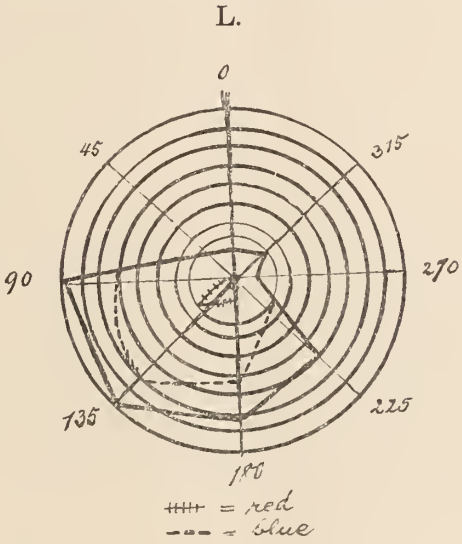

Fig. 15.

Field V. L. E., April 7, 1886. (Eccentric fixation, upward and inward.)

Robert R., æt 14. was brought to me by his mother, April 8th, 1886. Four years ago he was kicked over the right eye by a horse, and has been blind in that eye ever since. Two years ago he was hit in the left eye with a snow-ball which blinded him at once, and he had to be carried home. The left eye-ball was very red, and much swollen, as were the surrounding parts.

For some time he was almost blind, but the day after the accident, he could see a little out of the left eye, and in a short time as well as ever. One year ago the sight of the left eye began to fail, and in two weeks the sight was as bad as now.

A doctor treated him until lately with a battery, and he can see a little better.

Status Praesens. — Traumatic cataract R. — V. R. E. shadows. External strabismus R. — V. L. E. fingers at six feet. Eccentric vision (upward and inward). Ophthalmoscope shows detachment of retina of nearly the whole of the lower half of the retina, (lower and outer quadrant). Central arterial branches smaller than normal.

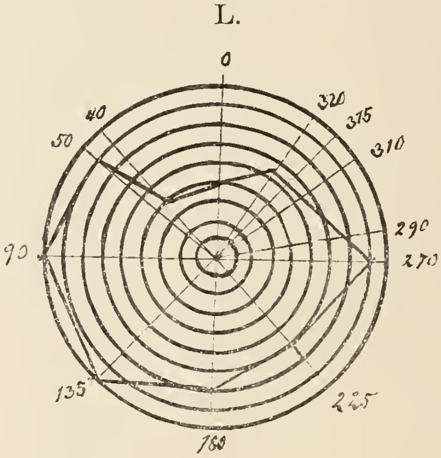

Fig. 16.

(Eccentric fixation ; upward and inward.)

The detachment extends to the edge of the disc downward and outward.

The field of vision of the left eye [Fig. 15.], shows not only contraction corresponding to the detachment, but also that of colors.

I resolved to make a thorough trial of free diaphoresis before undertaking any operation. This was carried out systematically and faithfully, the Turkish bath alternating daily with pilocarpine $\frac{1}{4}$ gr. After ten days, however, I gave the boy powders of sodium salicylate 5 grs. each, three to be taken ten minutes apart [15 grains] during the bath.

April 17th, fingers at 16 feet.

April 21st, field L. as in Fig. 16.

The fundus looks much better, the outlines of the disc being clearer, and the arteries fuller. Considerable fluid is still to be seen at the lower periphery, however. I now began the use of strychnia injections.

April 26th V. L. $\frac{13}{\text{L}}$; field V., same as on the 21st.

May 1st, V. L. $\frac{13}{\text{L}}$; fundus shows marked diminution of the sub-retinal fluid.

Field has extended outward and upward.

He now left for home with instructions to carry out the treatment by means of an artificial Turkish bath apparatus and the powders. I also instructed his mother to apply a pressure bandage at night.

So confident am I that a thorough diaphoretic course, carried out under the surgeon's eye, has everything to recommend it as a rational means of treatment, that I shall not hesitate to try it even in desperate cases, with or without puncture.

ON A MODE OF DETERMINING, WITH THE PRISOPTOMETER, THE DEGREE OF LATENT HYPERMETROPIA WITHOUT MYDRIATICS.

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(Retired).

The prisoptometer has been described heretofore. It exercises no influence on the refraction.

To determine the latent hyperopia, place in the holder of the prisoptometer a glass of + 7. dioptries, and add over it the concave spheric, which will cause the inner margins of the object circles of this instrument to touch. The degree of hypermetropia will be the difference between the positive and negative glass.

In testing this matter, I have called upon a number of my hyperopic patients, in whom I have, within a year, and in one case two years, tested the eyes under duboisine, and hence I know the degree of latent hyperopia in each case. These parties I have subjected to the above method of testing with glasses, and find that in the main the ametropia developed by the glasses corresponds with that found by the employment of the mydriatic.

To illustrate this subject, take the most simple case of hypermetropia, one in which the use of the prisoptometer shows no manifest ametropia. On placing + D 7. in the holder of the instrument, we render the eye artificially myopic = 7. dioptries, and we overcome all accomodation, certainly for the distance of the eye from the object circles, which in my instrument is four meters. We now place successively before the convex 7. D spheric, negative "d," see Fig. 17., or concave spheric—D 4. or — D — 5., and finally D 6. and with the latter the circles are rendered tangent at their inner edges. Taking the difference we have + D 7.0 — (— D 6.0) = 1.0, or 1 dioptric of latent hyperopia.

But this needs explanation and the following Figure 17 will aid in understanding the result.

The parallel rays passing through the + D 7.0 glass alone, induces an artificial focus, "at — D 7.0," and also 7. dioptries of myopia. We now add D, see Fig. 1, or — 6. D and this glass induces an artificial hyperopia, and neutralizes D 6. of the artificial myopia, and the focus is cast in the direction of the dotted lines upon the retina, and now the two circles of the prisoptometer are tangent. But the + 7. cannot overcome the — 6., hence, there must be an influence = — D 1.0 to neutralize the + 7. Remembering, that this + 7. induces myopia=7. D and the— 6. hypermetropia, = D 6.0, and considering the eye as a glass of + 1. D, it is plain that said eye furnishes the + 1.0 of real hyperopia. Hence, — D 7.0 — [(+ D 6. 0 + D 1.0) = + D 7. 0] = 0; or the focus is upon the retina, the object circles are tangent, and there is present in this example = D 1.0 of latent hypermetropia.

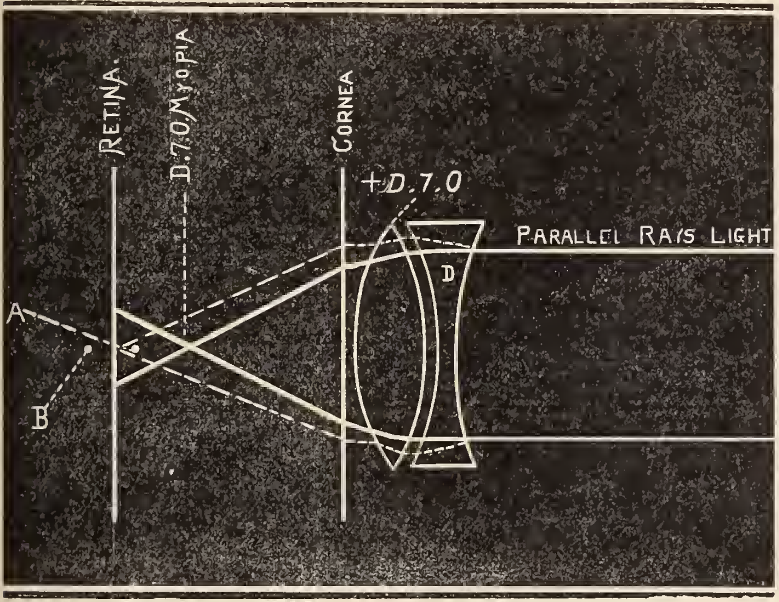

FIG. 17.

Therefore, the following rule is obtained for the first class, or when there is no manifest hypermetropia.

Rule I.—Place in the prisoptometer + D 7. spheric, and add the — spheric which will cause the object circles to touch, and this will denote the latent hypermetropia.

N. B. Weak convex or concave spherics should be tried when *the apparently appropriate negative glass* has been found, to see if *these* cause separation or lapping of the circles; and this caution should be observed in all the testing by this method for hypermetropia.

Case second—in which there is spasmodic or apparent myopia, and yet hypermetropia is present. Suppose such a case = — D 0. 5. Here the ametropic focus, from accommodation, is at A Fig.I . Add now the + 7. D. in the instrument, and there will be induced not D 7. artificial myopia, but the sum of this and the spasmodic myopia; or — D 7.0 + (— D 0.5) = — D 7.5. By successive trials of negative spherics, we find that — D 6.5. causes the object circles to touch. Hence (myopia) + 7.5.— (hypermetropia) (— 6.5) = + D 1.0. The latter quantity is hypermetropia, because the eye furnishes + D 1.0 of absolute hypermetropia, and hence — D 7.0 + (— D 0.5 spasmodic) = — D 7.5 — [(+ D 6.5 + D 1.0) = + D 7.5] = 0; or the object circles are tangent and the images in focus upon the retina. Therefore, if on testing with the prisoptometer we find apparent myopia, we observe the following:

Rule II.—Place the + D 7.0 spheric glass in the holder and add different concave spherics until the circles touch, then add to the number of dioptries of manifest myopia previously found, (= D 0.5 in the last case) to the + D 7.0 spheric, and from this sum deduct the number of dioptrics of the negative spheric required to cause the object circles to touch.

Case third—in which there is manifest hyperopia, as well as latent. Let us suppose a case in which on using the instrument the object circles are apart and the focus at B Fig. 1, and that a + D 0.5 causes the said disks to touch. There is = D 0.5 of manifest hypermetropia. Place + D 7.0 in the holder of the instrument, and we have not D 7.0 of artificial myopia but that quantity — the + D 0.5, or — 7.0 — (+ 0.5) = — D 6.5 of artificial myopia. Add now — D 6.0 spheric in instrument and the circles touch at their edges and their images, will be in focus upon the retina. Hence, we have under these glasses (myopia) + 6.5 — (— 6.0) = + 0.5 dioptries. But we have found that there is D 0.5 of MANIFEST hyperopia, hence this must be added to the + D 0.5 latent H., or + D 0.5 + D 0.5 = + D 1.0 of total hyperopia. However, this may be simplified by the following.

RULE III.—Place + D 7. in the holder, add the — spheric which causes the circles to touch and deduct the second glass from the first, which will give the total hypermetropia. To find the latent, deduct the manifest from the total hypermetropia. Practically we can deduce two rules from the three given:

First. In case there is no manifest hyperopia and when there is manifest hypermetropia, we deduct the negative glass from the positive, for the total hypermetropia.

Second. In case there is spasmodic myopia associated with latent hypermetropia, add the apparent myopia to the + glass and deduct from this sum the negative glass, required to cause the object circles to touch.

Appended is a table of cases representing these three classes of hyperopia. In some examples the results do not correspond with those shown under the mydriatic; but this I believe is due to the refraction having changed since their application. I am satisfied that if the two tests were applied at the same date, the results would be almost identical in the degree of ametropia.

CASES UNDER RULE I.

NO. EYE.

Mr. W. T. L., æt. 32. No manifest ametropia. Under duboisine has + D. 1. 0 H.

1. R. E. with + 7.— (—6.) tang = + D 1. 0 H.
2. L. E. with + 7. —(—6.) tang = + D 1. 0 H.

No. Eye.

3. Miss Z. D., æt. 16. No. man. am. in R. E. Duboisine. + D 1.0 H. With + D 7.—(—6.) = + D 1. H.

Miss T. M., æt. 20. No manifest am. R. or L. eye. Duboisine. + D 0.75 H.

4. R. E. with + D 7.75—(—D 7.0) = + .75 D.
5. L. E. with + D 7.75—(—D 7.0)= + .75. D.

Miss McC., æt. 13. No manifest ametropia.

6. R. E. + 7. — (— 6.) = + D 1. H. Duboisine same.
7. L. E. + 7. — (— 6.) = + D 1. H. Duboisine same.

Miss E. G. R., æt. 45. No manifest ametropia.

8. R. E. + 7. — (—6.25) = D 0.75 H. Duboisine same.
9. L. E. + 7. — (—6.5) = D 0.5 H. Duboisine gives D 0.75 H.

CASES UNDER RULE II,

SHOWING SPASMODIC MYOPIA.

No. Eye.

J. H. C., æt. 30. Each eye man.—D.5. Duboisine H D 1.

1. R. E. + 7 + (—.5) = + 7.5— (—6.5) = + D 1.0 H.
2. L. E. + 7 + (—.5) = + 7.5— (—6.5) = + D 1.0 H.

Mrs. M. R. B., æt. 32. Man. —D 0.5 each eye. Duboisine + 1.25 H.

3. R. E. + 7. + (—.5) = + 7.5 — (—6.25) = + 1.25 H.
4. L. E. + 7. + (—.5) = + 7.5 — (—6.25) = + 1.25 H.

Mrs. R. B., æt. 42. Manifest — D .25 each eye. Duboisine + D 0.75 H.

5. R. E. + D 7. + (—.25) = + 7.25—(—6.75) = + 0.5 H, lacks +.25 D.
6. L. E. + D 7. + (—.25) = + 7.25 — (—6.75) = + 0.5 H, lacks + .25 D.

Mrs. C. F. H., æt. 28. Manifest — D 0.5 each eye. Duboisine + D 1. H.

7. R. E. + 7. + (—.5) = + 7.5 — (— 6.5) = + 1.0 H.
8. L. E. + 7. + (—.5) = + 7.5 -- (— 6.5) = + 1.0 H.
9. Mr. C. B. C., æt. 23. Manifest—D 0.25. L. eye. + 7. + (— .25) = + 7.25 — (—6.5) = + D 0.75 H. Duboisine gives the same.

Mrs. E. G. R. Each eye manifest. —D 0.25. æt. 45. Duboisine gives + D 0.75.

No. Eye.

10. R. E. + 7. + (—.25) = + 7. 25 —(--6.5) = + D. H 0.75.

11. L. E. + 7. + (—.25) = + 7.25 —(—6.5) = + D. H. 0.75.

CASES UNDER RULE III.

IN WHICH THERE IS MANIFEST AS WELL AS LATENT H.

No. Eye.

Mr. H. C., æt. 58. Man. H. 1.5 D. Duboisine not used.

1. R. E. + 7. — (—5.5) = + 1.5 D. H.
2. L. E. + 7. — (— 5.5) = + D 1.5. H.

Miss H. A., æt. 19. Man. H. D 0.75 each eye.

3. R. E. + 7. — (—4.25) = + 2.75 H. 2 yrs. ago, Duboisine gave D 3.0 H.
4. L. E. + 7. — (—4.25) = + 2.75 H. 2 yrs. ago, Duboisine gave D 3.5 H. Probably the refraction in eyes have changed in two years.

Miss Z. D., æt. 16. Manifest + D. 0.25 H.

5. L. E. + 7. —(—6.) = +D. 1.0 H. Has under duboisine + D 1. H.

Miss K., æt. 47. Right E. man. + D. 1.25; L. man. + D 2.0.

6. R. E. + 7.—(—5.0) = + 2.0 H. Duboisine gives + 2.H.
7. L. E. + 7.—(—4.5) = + 2.5 H. Duboisine gives +2.5 H.

Mr. C. M. V., æt. 42. Man. H. D .25 each eye.

8 & 9. R. & L. E. each + 7.75 —(—7) = + .75 D. H. No duboisine used, and sees well in R vision with these glasses.

Miss A. V., æt. 41. + .5 H. man. each eye.

10. R. E. + 7. —(—6) = + D 1.0 H. Duboisine, 1 year ago, gave + D 1.5 H.
11. L. E. + 7. —(—.6) = + D. 1.0 H. Duboisine, 1 year ago gave + D 1.5 H.

Mrs. T., æt. 40. + D 1.25 H man. each eye.

NO. EYE.

12. R. E. + 7.—(—4.5) =H 2.5 D. Duboisine gives the same.

13. L. E. + 7.—(—4.5) = + H 2.5 D. Duboisine gives the same.

Mrs. LeR. C. Man. H. R. E., + D 1.5. L. E. man. + D 4.5 H.

14. R. E. + 7.—(—4.0)= + 3.0 H. January, '86 duboisine gave + D 4 H. There must have been some change in the refraction of this eye.

15. L. E. + 7.—(—2.) = + 5. D H. In January, '86, Duboisine gave + D 5. H.

Attention is invited to what has already been stated as to the influence of the glasses. in determining the hyperopia; the + inducing artificial myopia, and the —, artificial hyperopia. To illustrate, take eye, 3, under Rule II; or R. E. + 7. + (—.5) = + 7.5 — (—6.25) = + 1.25 H. This formula, according to the effect of the glasses, is as follows: R. E.—7. + (—.5 result of accommodation) = — 7.5 — (+6.5 artificial hyperopia from—glass) = —1.25 D. H. The latter quantity neutralizes the H. = D 1.25 of the eye. In applying the negative glasses behind the + 7. D spheric, each negative should be removed before a second — is applied; *i. e.*, suppose — 6. is behind the + 7. and the circles are not touching; it will not answer to add to the — 6. the — D 5., but the — 6. should be removed from the holder, and then the — 6. and the — 5. added simultaneously; because, then, the + 7. being in the instrument and overcoming the accommodation, the application of the two negative glasses will give the true refraction. If, however, negative 6. is permitted to remain in the holder, there would only be + 7. — (— 6.) = D 1. of accommodation to be overcome by the — D 0. 5 subsequently added, and which force the ciliary muscle might exercise and so vitiate the result.

REMOVAL OF A PIECE OF STEEL FROM THE CRYSTALLINE LENS.

BY DAVID WEBSTER, M. D.,

Professor of Ophthalmology in the New York Polyclinic, Surgeon to the Manhattan Eye and Ear Hospital, New York.

Mr. M., a blacksmith, aged 51, living in the interior of New York State, on January, 28, 1886, while striking a cold chisel with a hammer had a piece of steel from the edge of the chisel fly up and strike his left eye. Immediately after the injury he observed that the sight of the eye "flickered" but he could still see very well with it, and there was very little pain. He went at once to see the nearest physician who examined the eye and could find nothing in it. He went to see the doctor again the next morning on account of the pain in the eye, and upon examining the eye again the doctor found, that there was a foreign body in it but said it was too deep for him to attempt its removal, and advised him to go to see Dr. C. R. Agnew. On Tuesday, February 2, five days after the injury, the patient presented himself at Dr. Agnew's clinic at the College of Physicians and Surgeons. Upon inspection Dr. Agnew found a minute scar of the cornea just below and a little to the temporal side of its centre and what seemed to be a foreign body, enveloped in lymph, transfixing the iris near its temporal pupillary border and penetrating the lens a little to the temporal side of its centre. The anterior extremity of the foreign body projected, apparently, about a line into the anterior chamber. Atropine was dropped into the eye, and while the rest of the pupil dilated moderately well, the pupillary border at the site of the foreign body remained fixed.

Dr. Agnew advised that an attempt be made to remove the piece of steel, and sent the patient to the Manhattan Eye and

Ear Hospital for that purpose. The next day, Wednesday, Dr. Agnew, being called away on business, requested me to operate in his stead. As the foreign body was believed to be steel it was thought that the magnet might be found necessary during the operation. Accordingly we had a Gruening's magnet and a Hirschberg's electro-magnet on hand. Before the patient was under ether I held the Gruening's magnet close to the cornea, immediately over the foreign body for several minutes without causing it to move and without causing any sensation in the eye as though traction upon the piece of steel were being produced. Upon testing the strength of the two magnets Gruening's was found to be quite as strong as Hirschberg's, owing, I presume, to some defect in the electric current. The patient having been etherized I made an incision in the temporal margin of the cornea nearest the foreign body with an iridectomy knife, and as the point of the knife reached the foreign body before the wound was large enough, I enlarged it with scissors.

The extremity of the Gruening's magnet being too large to introduce into the anterior chamber through so small a wound without doing more violence to the eye, and as the experiment which I had made with it caused me to doubt whether it would attract the steel with sufficient power to remove it if I did introduce it, I decided to attempt to remove it with forceps. Accordingly, I carefully introduced a pair of iris forceps, curved on the flat, and seized the encapsulated foreign body and as gently as possible withdrew it. So firmly was the foreign body attached to the iris and lens by the lymph in which it was encapsulated, that I had to use conscious force in extracting it. A portion of the iris came out with it. Instead of replacing this inflamed portion of iris within the eye, I thought it the part of prudence to excise it which I did with scissors, leaving a neat coloboma with no iris in the wound. The encapsulated foreign body was placed upon the finger of one of the surgeon's present, and the power of the Gruening's magnet tried upon it. This magnet, which readily lifted a pocket-knife, or a pair of strabismus scissors, would not raise the foreign body from the finger even placed in immediate contact with it. This rendered it certain that an introduction of the magnet into the anterior chamber of the eye would have been worse than useless. After the mass of lymph enclosing the foreign body had become dry and was loosened up from the finger, the magnet raised it readily.

The eye recovered without unpleasant inflammatory reaction. The wound healed without anterior synechia. On February 17, fourteen days after the operation, the patient was discharged with vision $\frac{20}{\text{CC}}$ in the eye from which the spicula of steel had been removed, but with a blood stain covering the anterior capsule of the lens in the area of the coloboma. The eye was rapidly "whitening up." The foreign body was a very slender spiculum of steel some two and a half lines in length.

AN ACUTE ATTACK OF GLAUCOMA INDUCED BY THE LOCAL APPLICATION OF COCAINE.

BY JULIAN J. CHISOLM, M. D., BALTIMORE, MD.

Mr. C. G. E., aged 48, was operated upon for glaucoma fifteen months since. Vision had commenced to fail in the left eye with sharply bent vessels. V. = $\frac{15}{\text{LXX}}$. In the right eye he still retained good vision $\frac{15}{\text{XV}}$, with deep physiological pitting of the disc and bending of vessels at one part of the rim. From the double iridectomy he recovered promptly, and, by aid of reading glasses, has been doing well. Recently, he consulted me in reference to his glasses, which were not as clear as formerly and needed changing. There was myopic astigmatism $\frac{1}{72}$ — c to which was added presbyopia $\frac{1}{30}$ +. With these glasses he read Brilliant, and with the cylinder alone he exhibited V. $=\frac{15}{\text{XV}}$ showing perfect vision in the right eye. In this eye there had been for four days some mattering and redness, a catarrhal ophthalmia brought on by exposure in railroad travel. I suggested to him that a 1 per cent solution of nitrate of silver followed up by a zinc sulphate lotion would soon relieve him of the surface inflammation, and that to prevent pain from the caustic drop I would first use cocaine. The cocaine four per cent. drop was applied, and in five minutes the caustic drops. There was no discomfort from it for the moment, but, in ten minutes, the eye felt very hot and burning, which induced me to reapply the cocaine. This has been my rule of practice in catarrhal ophthalmia, to suppress the pain of caustic collyria by cocaine. As soon as he felt comfortable, he left my office with instructions to go to the hotel and apply cold cloths to the eye if it caused pain. Within three-fourths of an hour he returned to my office with the statement that his eye had become painful and that he could no longer see out of it. In closing the left eye he could not see to count fingers at two feet, with an eye which had $\frac{15}{15}$ vision one hour before. Upon examination, I found the pupil widely dilated and smoky. Tension +. An ophthalmoscopic examination showed no sudden hemorrhage, which I was fearful of. This gave me grounds for alleviating his fears with the statement that an antidote would soon make all right again. He had become sick from fright and felt very faint. I applied a one grain solution of eserine freely to the eye and drew blood from the temple with the artificial leech, also ordered cold cloths as a local dressing. In two hours there was a visible improvement to him, so that he could see again large objects, and, in six hours, sight had entirely returned to the extent of reading brilliant with his glasses and seeing $\frac{15}{15}$ for distance.

This is my first accident from cocaine. How many thousand times I have used it I can not say. For all eye operations, with the exception of enucleations, it is in daily use. I use it to quiet eye pains in all patients, allowing them to apply it as often as they desire. When I apply nitrate of silver solutions for catarrhal ophthalmia, each application of the caustic is preceded and followed by cocaine. If I remove a pterygium the patient is supplied with a cocaine 4 per cent. solution to drop in his eye whenever it pains. One nervous lady who had dropped ammonia into her eye instead of a borax lotion, used the 4 per cent. solution forty times a day for three days, sometimes at ten minutes interval or as often as the burning pain would be experienced, and no trouble came of it, although the cornea had a whitish look from the ammonia application when I first saw her. I had never had occasion to use it in glaucomatous cases, except in preparation for an iridectomy. The emptying of the anterior chamber with escape of acqueous would always remove all traces of the drug from within the eye. This is the first case that I can recall in which I have had occasion to use cocaine for any purpose in an eye that had been previously iridectomized for glaucoma, and, in this case, the disastrous action followed most promptly. In less than an hour, sight had been reduced from reading the finest print to counting fingers at eighteen inches. In this case it would seem that the excessive dilatation of the pupil had, in some way, interfered with the circulation in the canal of Schlemm and had brought about injurious pressure. As soon as the counteracting influences of the eserine could be obtained and a decided diminution of the pupil procured, the products of the temporary congestion disappeared. Notwithstanding the iridectomy, the iris acted promptly from each of these agents. The cocaine caused such a dilatation of the pupil that only a small rim of iris was visible. In time the eserine overcame this and in its turn drew up the pupil until it was nearly hid under the upper lid. It was owing to this fact that the glaucomatous condition was so promptly brought about, and fortunately for the patients, relief, so readily secured. Should this accident have occurred in the hands of a general practitioner, and antidotal remedies not at once applied, the results as to vision must have been most serious.

CORRESPONDENCE.

Adolf Alt, M. D., Editor American Journal of Ophthalmology:

Dear Doctor:—I notice in Vol. III., No. 6 (June) of your Journal that you quote in an article on the "Histology of Trachoma," the method of forcible expulsion of the contents of all follicles, by pressure, in the treatment of that disease, as Dr. Hotz's method. Permit me to claim priority, in so far that in May, 1883, I read a paper before the Medical Society of the State of Pennsylvania, entitled "Some Ophthalmological Observations during ten years' service in Will's Eye Hospital," in which I call attention to this method of treating granular lids, and describe the same way of doing it, by pressure with the fingers, etc.

This method of treating trachoma I discovered myself, and had been carrying it out, as well as teaching it, for several years with great success both in private and in my clinic, before I wrote and read my paper. See Transactions of the Medical Society of the State of Pennsylvania, for 1883.

As far as I can learn, I am the first to treat trachoma in this way, and to lay the method before the profession in this country.

On June 20, I received my copy of the *Archives of Ophthalmology*, and, noticing Dr. Hotz's paper, I wrote to him at once in relation to this fact, and I ask, in the cause of justice, that you make a notice of this in your journal.

I am, very respectfully,
Peter D. Keyser.

Philadelphia, July 11, 1886.

EDITORIAL NOTICE.

Dr. Prout's and Dr. D. Webster's papers, published in the July number of this Journal, were read before the American Ophthalmological Society at New London.

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THE HUMAN COLOR-SENSE CONSIDERED AS THE ORGANIC RESPONSE TO NATURAL STIMULI.

BY L. WEBSTER FOX, M. D., PHILADELPHIA, AND GEO. M. GOULD, A. B.

Were one a Comtist student of light and color, he could point to no branch of human knowledge, illustrating, at least so far, more appositely than that of chromatics, his master's three-fold division of the states of science, into "theological, metaphysical and positive." For untold ages men had worshiped the sun, the stars, fire, light, with all degrees of intellectual abjection, or intellectual perfection, from the lowest fetichism of a savage, to the most idealized symbolism of a Dante, before the subtile but simple conception of the undulatory nature of light, or the "metaphysical" explanation, occurred to the mind. Thanks to the labors of many great students and profound thinkers in the past three hundred years, we are now in the clear as to this second stage; the physical causes of vision are quite decisively settled; the causes of ether-waves, the laws of their action and propagation, their measurements and powers, have all been made out, and there is probably little left in this direction to discover. Men's minds therefore turn to the "third stage", and try to show the relations, successions and resemblances of these to other phenomena. But here the Comtist theory meets a check; modern science has advanced the sphere of its activity and work into regions undreamed of, and wholly discountenanced by Comte's scheme. We are not content to study external phenomena *per se*, however wide the relations established. No science of today is content to see forces disappearing behind the Isis-curtain of the mind, and other and transmuted forces reappearing from that veiled sanctuary, without seeking to push aside that curtain, and learn what is the mystery there. So it is that all knowledge has remotely or directly a vital interest in those new methods of research, inaugurated by evolution and controlled by exact science, which we call physiological psychology, or psychiatry. It is found that no study of the relations of diverse phenomena is for a moment complete or satisfactory without psychological phenomena are included. Tyndall enjoins: "The roots of phenomena are imbedded in a region beyond the reach of the senses, and less than the root of the matter will never satisfy the scientific mind." Only by thus extending the scope and extent of the relations of phenomena to those of physiology and psychology can the Comtist's third stage include the recent development of light-studies.

In following along the path of light in its progress toward the brain, it was but natural that the eye should have arrested the attention of students, and that the advance of optical studies should have been stopped till its mechanism and powers had been duly apprehended. Moreover, if the intricacy and marvelousness of its construction be considered, it is all the more natural that, so long as its function remained mysterious, the crux of the whole problem of vision should have been lodged in it. In this way arose the idea of its specific functions, and from Herschell and Newton, to Young, Helmholtz, Hering and Preyer, the retina has been supposed to have a differentiating and specific energy, whereby the phenomena of chromatic sensation were explainable. Gradually, however, it is becoming plain that the retinal end-organs, as well as those of other senses, have no such power; instead of this the retinal function must be held as simply correlating the physical stimuli with the psychic reaction, and without power to create specific differences in the stimuli received by it. Some of the grounds of this new envisagement of the phenomena are to be found in Wundts' now classical work; other statements of the same necessity are expressed in articles by H. M. Burnett, M. D., in the *American Journal of Medical Sciences* for July, 1884, by C. A. Oliver, A. M., M. D., in the same journal for January, 1885, and by the writers of the present article in the July 1886 number of the AMERICAN JOURNAL OF OPHTHALMOLOGY. We there try to advance a step, and give a nearer answer to the question as to the more intimate nature of the retinal process. We described it as a refined and delicate perception of thermal differences, if not identical, certainly not dissimilar from the function of the peripheral sensory end-organs. The facts of physics and physiology seemed to demand the supposition of a retinal intermediate, vibrating in correspondence with the varying wave-length of the ether, whose kinetic energies it transmutes into its own molecular activity, and the varying degrees or heights of this molecular activity are taken up by the cones and transmitted to the co-ordinating center for reworking into the cerebral products of color and light.

It was thus found that the result of this was to transpose the seat of the difficulty from the retina to the brain. Were we system builders, we might say that the progress of knowledge in regard to vision consists indeed of three stages: physical, physiological and psychical,—the first, in systematizing and formulating the laws of ethereal vibration; the second, in tracing the laws of the transmutation or causal relations of the ether-wave stimuli and the succeeding nerve-message; the third, in explanation of the transmutation of neural vibrations into the sensations of light and color. We have said the problems of the fiist stage are now answered. The difficulty encountered in the second was greatly increased by what we believe to have been the error of confounding it with the third. With its supposed specific function, the mind's work was given to the eye to do, and in trying to explain how it might do what it never did do, have resulted all the *de haute en bas* theories and illogicalities of ingenious *soi-disant* discoverers.

In the belief that greater clearness has been reached by eliminating the idea of specific activity from the retinal function, and particularly in regarding that function as essentially a refined perception of differences of molecular activity, we may think more justifiable any attempt to attack the mystery in its new home. We therefore purpose offering a few suggestions as to certain aspects of chromatics from the psychical stand-point, hoping to strike more natural lines of cleavage than has happened heretofore.

In order more precisely to make clear the design we have, let us for a moment hark back to our ether waves; this is all the more necessary since we would do away with the color producing agency of the retina, thus more than ever emphasizing the strict psychological nature of color. *En passant* remarked, it is a rather strange fact how little it has entered the popular imagination that no such thing as color exists outside of the mind. The writer shall not soon cease to regret his temerity in stating this fact to a college graduate and bank president not long since. The remark was met by the silence of dignity, but the ill concealed look of scorn and disgust thinly veiled my friend's thorough belief that I was a fool, or took him for one, in thus trying to guy him with such absurdities.

In a very few people there is a sort of vague compromise in a misty idea that the *eye* may have a little to do with the process, but in attempting to pull this poor support from under them, they would, like the banker, fly to "non-existent objectivity," rather than float in the thin air of "subjective certainty."

In the visible (interference) spectrum we have spread out before our eyes a band of ether waves, differing from each other only in their length and in the corresponding frequencies of their arrival. The wave-lengths, gradually, and without any breaks, vary from .00007604 cm. to .00003933 cm., while the frequencies extend in the same graduated way from about 395 to 764 millions of millions per second. We know that in these facts alone consist all the differences there are out there; color and light do not yet exist—that is, if a blind person could feel these taps separately upon his finger-ends, and count them, he would then know the sum total of the external phenomena. What we wish to call particular attention to is the unbroken continuity and gradualness of change in this wave-scale. There are no great jumps from waves of one frequency to those of another above, but each glides gradually, and by slow changes into a frequency not greatly different from itself. But when the mind directs the eye to this band, an inconsequential result appears in consciousness. The spectral colors are not a continuously and imperceptibly changing ascent, but consists of a few large steps, or bands of colors, more or less perfectly marked off from each other by delimiting intermediate shades Within the same color step whose hue seems in all parts identical to the eye, the waves differ often by so much as from five to ten, or even more, millions of millions of vibrations per second. At other points several different tints, or even perfectly defined colors, are caused by no greater different vibrational periods. Again, certain of these colors have been called primary or elementary; but why they have any such a quality, and why the spaces they occupy are relatively so great, and so different in extent as they are—these, with others to follow, are questions we have never heard asked, and so, of course, have never seen any attempts to answer. Yet these are the very queries that arise unbidden in the mind upon looking at this mysterious chromatic ribbon.

Sunlight, we are told, is composed of the following parts:

54	Red
140	Orange-red
80	Orange
114	Orange-yellow
54	Yellow
206	Greenish-yellow
121	Yellowish-green
134	Green and Blue-green
32	Cyan-blue
40	Cyan
20	Ultra-marine and blue-violet
5	Violet
1000	

Condensing the intermediates with the principals we have:

Red colors	194
Golden colors	454
Green colors	255
Blue colors	97
	1000

We have an instinctive tendency to compare the color band or scale with the musical scale; but when we do so we are landed in a maze of difficulties. We realize in sound a higher and lower, a logical connection, order and uniformity of intermediate steps. We are, therefore, bewildered to find, as we do, that there is nothing compared to this in color. There is no up or down, high or low; there is no octave, not even a completed circle; the intensity of sensation does not follow wave-length or even luminous intensity. The maximum of luminosity is in yellow between D and E, but green, a comparatively dark and cold color to the imagination, is not vastly less luminous, while it is far more so than red, which, of all colors, stands out most vividly to the mind's eye. We are perplexed to find no law or reason governing the position, extent, or psychological characteristics of colors.

We think we shall find that much of our amazement and inability to see law and reason in the phenomena arises:

1. From our inattention to the history of the physical stimuli of the eye, to the relative quantities and persistencies of the great classes into which ether waves may be divided, according to the natural objects from which they have, in all past time, been reflected into the eye: and,

2. From our inattention to the psychological history of vision, the psychical origin of color, and the influence of the mind and feelings upon color phenomena and perception.

History, then, is our hunting-ground, evolution our falcon, and the quarry we seek is answers to these questions:

1. The reason why certain colors are called primary or elementary?

2. Why the relative amounts of the primary colors vary as they do in the (normal) spectrum?

3. The explanation of the differences in the objective or luminous intensities of colors?

4. The reason of the differences in their subjective intensities and qualities?

We wish the reader to suppose himself never to have seen or heard of a spectrum, or a theory of color-perception; we know he is a cultivated nineteenth century gentleman, well acquainted with history, especially of primitive man and religions, and well versed in Darwinian principles. We can assuredly congratulate him, both upon his ignorance and upon his knowledge! If we ask him what great color-classes of visible objects have most occupied man's eye and mind in all past history, we are certain his answer (after as much reflection, *parbleu*, as we ourselves have given it) will be something like the following:

The first in overwhelming importance is light and fire; the second, the world of vegetation; the third would be blood, as the concrete representative of war and struggle, and superstitious symbol; the fourth, the sky above with its reflection in the waters of the earth. It would be difficult to name another class, for whatever other colors nature may have presented to the eye of historic man, they must have been mixtures of these, or unimportant exceptions that have left only a small and inconsiderable organic response in the psychic mechanism.

Let us briefly emphasize and differentiate these four classes of stimuli a little more closely:

1. LIGHT AND FIRE.—It has been said that stimuli of achromatic light are responded to by the infant before those of color, whence, if true, it would be rightly argued that achromatic vision preceded chromatic in the life-history of the animal kingdom. The absence of cones in many animals points to the same conclusion. Perceptions of differences of luminous intensity, as we know from the facts of color-blindness, may still give such animals much of the advantages we derive from color sensations. We allude to the matter here as of importance in showing the probable priority in time, as well as the past and present preponderance of the amount, of such sensations over those of others. With these we class the yellow and orange colors, begging the scientific reader not to start back in disgust, but to consider the following facts: The ordinary suffused daylight, even of a clear day, is slightly yellowish, and in almost all degrees of obscuration of the sun, the more refrangible rays being cut off, the indifference-point of the spectrum is sent farther down into the yellow band. Whether from a greater turbidity of the atmosphere, or increase in thickness of the several mile deep dust-shell always present over the earth, or from the morning and evening obliquity of the sun's rays, much of the *day* of

average humanity has been more yellowish than they perhaps mistrusted. This, it is probable, was more pronouncedly the case in the earlier stages of the world's life. Moreover, the rising and setting of the sun have always flooded the earth for one or two hours each day with a glory of orange or golden radiance. It is also certain that our earthly fires are of a ruddy, golden or yellowish hue, and the scholar of mythology and early religions, knows well enough the part fire has played as a representative of the unseen divine life, or as an homologue of the recurrent changes of the lights of the sky by day or by night. "Pyrolatry," says a life-long student and historian of ethnic religions, "is common to all religions." "Through the whole history of Aryan faith runs the fire symbolism of Mithra." "Jahveh was originally one of those sun-gods in whom all Semitic worship was wont to centre." Quotation from a thousand sources could be added, all of the same import. We all know the beautiful myth of Prometheus and the stolen fire. Ever since man's dawning intelligence caught a glimpse of the mystery of light, of the wonder of the strange lurid glow of the sun at eventide—nay, even back to the time when, by its aid, he cooked the flesh of the animal whose blood he had shed, the wonder of fire was daily and hourly before and in his eyes. Further reason for including the daylight, the sun-shine and the fire hues under the general term golden, comes from the symbolism of gold itself, which, in all ancient faiths, as well as in the instinctive feeling of the modern artist and poet, is the representative metal and color of the divine glory and halo. Perhaps it would not be unwise to say that gold is now the standard of all values, and held to be the loveliest of metals, because it was once the symbol of all light and the ornament of the divine image.

To this consensus of reasons might be added the comparative absence of whites in nature. Clouds are sometimes a dull or grayish white, and snows, however considerable in some countries, are certainly the world over, a small and short-lived covering of the earth's surface. Wherever white sunlight falls on land or tree or rock, it is always reduced to colors by the unequal absorption and reflection following; these colored reflections are the eyes' customary stimuli. When sunlight falls on the sea only a small portion of the surface reflects white back to the few eyes there or thereabouts. So that as a fact white sunlight is generally reduced to yellowish tints, or other shades before it reaches the eye. Where this is not the case, the rays are too powerful, and producing unpleasant effects upon the eye, are avoided.

The closeness of the relationship between white and golden light is also shown by the ease with which spectral yellow, by increase of illumination, passes over into white, being, as it is, the nearest of all colors to the luminous intensity of that compound. Consequently a complementary color of the lower kinetic value is all that is required to quickly heighten it into the white to which it is so closely allied.

The proportion of the spectral golden rays, 454, or nearly half of the whole, represents the overwhelming part the lights of day and of fire have played in the world's history. The unity of character running through this vast space of the spectrum, testifies to the unity of the cause, and to its power both physically and mentally.

II. THE VEGETABLE WORLD—whose greens have taken up the next greatest portion of the spectral rays—representing one-fourth of the whole—is so plainly the origin of the green band of the spectrum that it is unnecessary to go into detail concerning it. When eyes appeared, next after the golden light of day, they would certainly fall upon some of earth's verdure, and except to the city-man, the proportion holds up to to-day. Green is philologically the growing thing, and grass or tree covers the face of the earth.

RED, occupies the next lower degree in the proportion of the spectral waves. The crimson of the fruit man ate, or of the wine he drank, the deeper orange hues of the flame-points or embers of his hearth-fire, the autumnal reds of the forest trees, or the expansive glory of an occasional scarlet sunset, would not, all combined, account for the proportion of space it occupies, and are infinitely far from explaining the intense and distinctive character of the subjective sensation of spectral red. It can only be explained by the role war and blood-shed, blood sacraments and rites, have acted in the history of the race from man's egress out of animalism and *progress* to nineteenth century militarism. The blood is the life; and life, so far in our planet's history, has been a perpetual *bellum omnium contra omnes.* Nature herself, as our great Christian poet declares, is red with tooth and claw, while the condition of all savage races *now*, show that it was always so with our own ancestors. A curious and deeply instructive book has lately been published, *The Blood Covenant*, by Trumbull, in this only, and so far as our knowledge goes, can one learn something of the influence of the vision of blood-shedding in the early world. It is an instructive though ghastly picture, that, despite the author's sympathy and sanction, makes one shudder. Strange insights, these, into human nature, which we gain in reading of the blood-drinking, blood-bathing, blood-ransoming, blood-unions, blood-compacts and friendships, blood-sacrifices, and blood suppers, blood burials, blood cures and sprinklings, bloody hands and uplifted arms, blood transfusions, human sacrifices and cannibalisms, bloody burnt-offerings, blood-stained ark of the covenant, bloody passovers and blood atonements ! And all this in times of peace ! What an echo of long ages when blood shed was no mimicry ! The bloody idea is certainly "nail'd wi' scriptur." This is all legend and myth; when authentic history begins, it writes of the sword and red-handed death; the record rolls on with the tired centuries depicting one monotonous tale of sanguinary strife. "War is the matter which fills all history," says a great historian. One million nine hundred and forty-eight thousand lives lost in the last twenty-five years in European battles, and twelve billions of dollars worse than wasted, is the last record, with Europe a huge camp to-day. We spare the reader further quotation and detail we had prepared.

IV. The Proportion of Spectral Blue is small in extent and weak in power; it has a character of distance and impersonality exactly corresponding to the sources whence this color has reached the eye. The sky is above, but man's eyes are seldom raised to it. At the horizon it often fades to the violet in which the spectrum likewise passes out of sight.

Rassemblons nos faits pour nous donner des idées.

1. In answer to the first query we started out to solve, cer-

tain colors are called primary or elementary, because they have been derived from these great divisions of natural objects we have reviewed. They have been the uninterrupted stimuli of the visual function, since the brain sent its retinal servant out to the body's surface to see by its aid. Some are, if we may so speak, more "elementary" than others, in the sense that some stimuli have been either more prevalent, more powerful or more vitally interesting than others. This is overwhelmingly so of red and gold. In Swinburne's Poems and Ballads, Mr. Grant Allen found the red epithets numbered 159, the gold 143, the green 86, and the blue 25. In Tennyson's Princess the same proportions were 20, 28, 5, 1; and it was so in other cases.

2. A *color* of the spectrum occupies just that amount of space, or, to put it in another way, waves of more or less extended differences of length are perceived as a single color, just as the bulk of the waves from each of these classes of objects have been most uniformly and persistently reflected into the eye during the growth of the race. Nature has acted upon the organism in these continuous ways, and the cerebral product is the spectral colors, in the proportions, and with the characteristics, we find appearing in consciousness. The largest and most persistent stimulus has been that of the gold rays—the varied shades of the diffused light of day, or the ever-present mystery of fire. These have been poured in profusion into all eyes, comprising nearly one-half of their total stimulus, while the green rays make up a fourth, the red less than a fourth, and the blue a still more limited amount.

3. It is a remarkable fact that the objective luminous power follows the same law, and is not caused as we might *a priori* suppose, by the wave-length. According to the latest measurements, by Messieurs Macé and Nikati, the following are the relative luminous powers of the wave systems corresponding to the wave-length first given, the highest power, corresponding to wave-length 569 mm. millionths being given as unity:

$$\frac{681}{0.015}\ \frac{656}{.080}\ \frac{641}{.111}\ \frac{613}{.252}\ \frac{589}{.768}\ \frac{569}{1.000}\ \frac{550}{.954}\ \frac{534}{.512}\ \frac{527}{.400}\ \frac{520}{.314}\ \frac{507}{.128}.$$

In order to reach the same result of visual acuity, as in the 569 rays, the quantity of light of red, had to be increased sixty-six times, of green three times, of blue eighteen times, of extreme violet 5460 times.

The explanation of these figures will be found to lie in the physiology of the retina- The stronger waves do not, as we see, produce the mostpowerful effect ; indeed, the luminous intensities have no relations with refrangibility, but seem to depend on facts of another order, which consist in utilizing the residue of rays left over after the absorptions of natural bodies have been satisfied. The greater the wave-length the more wholly such are absorbed, until the line of the descending curve dips pretty low down in red or orange, when the residue becomes so great that the the light-curve takes its swift rise, to fall gradually from its crest in D$\frac{1}{4}$E. to the extreme end of the visible spectrum, where the dispersive forces of atmospheric refraction allow few of the more refrangible rays to pass to the eye. So the retina has learned to react, not to the most powerful, or to the finest, but to the most continuous and steady stimuli. Its response, therefore, is more perfect to the gold rays, next to the green, lastly to the red and the blue, as Macé and Nikati have found.

4. But there has been a great failure to differentiate the objective from the subjective intensity. Confounding these wholly different phases, has resulted in the *non sequitur* of Magnus and Gladstone, who think red was the first of the colors historically developed. To this we shall return later. Color being a creation of the mind, and after a double transmutation of forces, it follows that its subjective character, may, in part, be independent of objective causes, or direct stimulation,—may be a complex whose elements are by no means all gained through the retina or the visual mechanism. A thousand facts prove, that of all the senses, vision is the most freed from the bonds of logical and necessary connection with the primary sources of stimulation. No fact is more strikingly characteristic of this law than these differences between the objective and subjective intensities of colors. As we have just seen, the order of the former is the highest in gold, falling then to green, red, blue ; the order of the second is red, golden, green, blue ; and precisely this order tallies with that of the vital and personal

connection with man's life of the four classes of natural objects we have named. The mordant acids of life's needs and passions have eaten these tones deeply, or less deeply into man's brain, according as they have in varying degrees been associated with his miseries and gratifications. Only on this principle can the vivid and powerful effect of red be explained. If private and public blood shed, if social and religious blood covenants, all of which have always been bound up with every day of humanity's advance, — if these would not have bitten into his being an intensity of response unapproached by all other chromatic stimuli, then, the laws of reaction and association taught by scientific evolutionists are empty of force and void of truth. In the language of physiological psychology, this fact might, perhaps, be expressed as the demand for more numerous connections with other cortical centers corresponding to the variety of interest the stimulus excites in them, and the power required in co-ordinating the multitudinous waves of emotion called forth.

The most valuable thing to a man, is of course, his life, symbolized forever, in fact and in covenant, in rite and in ceremony, by his blood. Next to this comes the light of day and of fire, which he has always represented to his mind, as it has been to his eye, of a golden hue, under which term may be accu. rately grouped the changing effects of the ruddy, orange, or yellowish whites, of light and fire.

Among earth's vegetation man has, of course, built his home ; but there is in the subjective green a lack of power and intensity exactly corresponding to the nature of our impersonal and semi-independent relations to the verdure and growing things about us. In blue these qualities are exaggerated into the feeling of distance and coldness and elevation, derived, of course, from the far away mystery of the sea and sky.

THE INTERMEDIATE COLORS OF THE SPECTRUM should be considered for a moment. The fact of their existence is almost forgotten by color students. This neglect is all the more remarkable when we observe their amazing extent. While each pure "primary" color comprises from forty to eighty parts, we find the mixed intermediates stretching out to 140 between orange and red, to 114 between orange and yellow, and to 327 between yellow and green! Strictly speaking, these are just as "primary" as the other shades we call red, or yellow, or green. The whole nomenclature is relative, a mere thing of custom. If simple spectral space occupied, or, if the proportions these intermediates bear to the whole number of rays, were decisive, the small spaces of the purer colors would serve as the unnamed delimiting lines for the other and larger stretches and quantities. The extent of these spaces shows us how differing nature's "colors" are from those of the mind, or rather, what receptacles and constructions the mind puts upon the color-intimations or hints of nature. Nature's colors are always broken and mixed; the spectrum gives us homogeneous wave-systems, sorted out of the compound, and arranged seriatim. The prism brings order out of chaos, whilst the mind still further idealizes and reconstructs for itself another world out of the spectrum, by ignoring the mixed intermediates, and emphasizing the small spaces more pleasing to it. But, keeping close to nature, we must ask concerning the significance of the extensiveness of these spaces. This can only lie in the fact that nature's colors are not saturated (from homogenous wave-systems of maximum strengths), but are always from mixed wave-systems, culminating in a higher average of those of one of the four primary colors in each of the four classes of phenomena mentioned. The ocean swell may be made up of many lesser crests and troughs, but there is always one point where the general variations reach their maximum, and this would correspond to the narrow limits of the *pure* color. But between these crests are large regions of indeterminate mixture. Between the pure hues of the deep autumn reds, and the paler yellows, and beyond the rapid instants of ruddy flames and setting suns, are the multitude of ever changing tints of brighter glows, which account for the 140 parts between spectral red and orange. In a like manner we perceive the rationale of the 114 parts between orange and yellow, whilst the protean changes and mixtures of the ever-varying light playing amongst the myriad tinted shadows of the infinite variety of vegetable forms, produces the enormous interspace represented by the

327 intermediate parts, between the yellow and the green of the spectrum.

It will be seen that our endeavor has been to institute a correspondence between luminous stimuli from the natural world, and the chromatic effects of the spectrum's analysis, upon the mind. In all text books and expositions of chromatic and prismatic phenomena, the facts are placed before the awe-struck mind of the beholder without a word more explanation than nature herself vouchsafes. "Beauty is its own excuse for being." The colors, forsooth, are produced by the varying wave-lengths; but why the order, why the quantities, why the amounts, and a thousand other whys—these have always been starting up in the mind of the cause-seeking student. His answer has been the old one given to little Peterkin, when he wanted to know "what was it all about." We indulge the hope that by some such method as we have tried to strike out in this crude fashion, the answers must be finally found. Our color sense must be the organism's response and reaction under stimulus; in a word, it must be investigated by the methods of study which evolution has taught us to use with such brilliant results, in all other departments of biology. The hand of a man, the wing of a bat, the dog's fore-foot, and the horses' fore leg, the bird's wing and the seal's paddle — these are all modifications of one structure, according to the work to be done, and in response to the peculiar stimulus; just so the cerebral products of multiform color-stimuli have left their psychical analogues in our own complex color-sense. The historical and comparative method must likewise be adopted here. For two thousand years psychology hardly advanced a step, because it only interrogated the single and then present mind. Deductive and *a priori* cloud-capping systems of metaphysics and speculation ended in Hegelian Quixotism, and "subjective camels" of strange morphology. Survival of the fittest and comparative methods put an end to all that, and it may be hoped that the same historical method will unravel chromatological problems which have, as we have seen, not been even stated so far.

To a genial and enthusiastic populariser of the evolution philosophy is due the honor of the first tentative effort in this direction. Mr. Grant Allen, (*The Color-Sense*), sought to explain our color-sense through its development, at first, in insects, seek- the nectar of flowers, and also in frugivorous animals, by spying out colored fruits. The book is inherently interesting and valuable; the theory is good enough so far as it carries, but it is not to be forgotten that the flowers are the absolute creations of the eyes, and not the eyes of the flowers; it is hard to escape from the logic which demands a pre-existent color sense of some kind before flower and fruit could utilize the owners of eyes as their messengers and express-agents. Apart from this, we are, if at all, certainly *very* remote descendants of insects, and are quite far away from the birds and such frugivorous folk.[1] It remains to us a marvel of oversight, a curious instance of *idée fixe*, that the great sweep of the mighty forces we have tried to hint at as causally operative in forming our color-sense, should have escaped the gaze of this writer, otherwise so keen of sight on the evolution trail. To have credited these two influences, which, however real and operative in their limited field, were yet trivial and comparatively of little reach, with the construction and organization of our widely complex chromatic sense is a fatal illogicality. He should have taken to heart his own noble and true saying, that, "Evolution forever impresses upon us the lesson that if we would be good philosophers, we must forget our philosophy."

We may in passing allude to the discussion concerning

THE HISTORICAL ORIGIN OF THE COLOR-SENSE.—Gladstone as a Homer-student, and on simple philological evidence, tried to show that "they who fought at Troy" were as blind to certain colors as Homer himself (supposably) was to all. Dr. Magnus, in Germany, drew the same conclusion from a wider sweeping of word-lore. The whole affair was a dismal collapse, and Allen pricks the bubble with justifiable satisfaction. It was hardly to be expected that if ants, bees and birds had such highly developed chromatic powers, even savage men should be so far behind them. Present day barbarians have essentially the same power in this respect as ourselves, though extreme delicacy of perception is, to be sure, not so highly developed, and their nomenclature would of course be very faulty or deficient, as Gladstone and Magnus might have supposed. The savages' delight in color, as shown in tattooing, and decorating his body, presupposes the ability to feel the differences in color quite as accurately as the birds, whose bright plumage he adorns himself with, and who have no words for colors either. The development of color perception lies far back of all this, and is as old as hunger, in satisfying which, and by the attacks and escapes of enemies, it quite certainly took its rise. The sobering remark of Wallace is also *a propos*, that it is the absence of color that would require accounting for; he says that the most conspicuous pigeons, whether by their color or by their crests, are all found where they have fewest enemies. There seems, indeed, to be an exuberant energy in all organized things, which is only kept from developing variations, and ornaments, and bright colors, by the necessity they are all under of escaping pursuit or hoarding their powers. So it may at last turn out that animals are as bright and beautiful as they can be, consistent with the more important law of self-perservation.

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[1] As to reasoning concerning the subjective quality, or character of the sensations of color in animals, it must for the present be pronounced out of the question. The subjective expression of the stimulus can only be compared in beings whose minds and psychological histories have been the same or similar to our own. The character of red, e. g., to the animal, as to us, must depend upon the connection of "red" things to the past history of his race.

The fact that in $\frac{99}{100}$ of all color blindness, perception of red seems to be the deficient power, would imply that it were the latest, instead of the earliest acquirement, as has been held.[1]

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[1] A great support of the Hering theory lies in the bipolar nature of color-blindness, red-blindess being always, or generally associated with green-blindness. But if red be thrown out of the complex of elements making white, by some unexplained pathological condition, the resulting unity of white, the indifference-point of the spectrum, is moved forward into the green space, and the neutral indeterminate we call white, supplants the green sensation. By a musical note, continuously sounded, the ear becomes incapable of hearing that note; silence results; so, blue glasses, continually worn, destroy the possibility of perceiving blue. In this way the transparent or invisible nature of the indeterminate compound we call day-light white, is explainable, and the similar extinction of green, when red is thrown out of the compound. In total color-blindness, blue sensations are wanting from the same reason, that the indifference-point is removed to the place usually occupied by blue.

The delight of children and savages in red, and the coarse æsthetic sense, might in part, be explainable in the same way, but more accurately and perfectly by the subjective vividness and associations resulting from numberless centuries of blood-covenants and blood-shed. Red is the color of war; savages tattoo themselves with it to arouse their own blood-thirsty instincts, and to strike terror into the hearts of their enemies. That the prevalence of red pigments in nature, the ease of procuring the ochreous earths, and the relative difficulty of getting other pigment colors, would explain the savage predilection for red, is perhaps a slight coign of vantage, but it remains still an example of the triviality of the arguments to which theorizers have been driven. In continuance of the same symbolism as the bedaubed Indian gives to red, it has continued till to-day as the color *par excellence* of military uniforms. The delight in it by the crude æsthetic sense flows naturally from the ages of history when bravery and courage were in man almost the only, certainly the highest of all qualities.

THE ÆSTHETIC SYMBOLISM OF COLOR. — In accordance with our conceptions of the origins of our color-sense, there should be a natural association and symbolism of the different colors with the great classes of our emotional states. If man himself is the concrete result of cycles of permanent reaction between organism and environment, then his visual sense must find its ultimate explanations in the same process, and, like them, look forward to extension and perfection, on the same lines as its development has followed. Now, upon looking within, it is not a little startling to find the great divisions of our psychical nature corresponding with the great associations and divisions of our color-sense. It would be still more striking, if we were not now partially aware of the role color has played in history and in the development of the mind. All objective existences are perhaps more vividly represented to the imagination as colored things, than in any other way, and their associations with the woes and joys of life point to no fanciful symbolism, but one which is quite as real and vital as the emotions whence he draws his mental life. Classifying the directions and methods of mental activities, we find them to fall naturally into four classes: —

1. Those of the Passions, — the emotions pertaining characteristically to the sensual life;
2. Those of the Intellect or Reason;
3. Those of Utility and Labor;
4. Those of his Spiritual, Moral and Religious Nature.

These we find to correspond in an exact and specifically real sense with the four analogues of the chief colors previously set forth. Blood is the life, — the nearest, most precious, and vivid of all things or thoughts. Golden light is next in its necessity and nearness to our daily life; of green we are somewhat more independent, while blue is far away and beyond the reach of our earthly cares and wants.

The symbolisms of red are, therefore, perforce, those of the two great factors of history, War and Love.[1] That only the homologues of the rigorous challenge of red.

In the same definite way the symbols of golden light apply as fittingly and restrictedly to the light of reason and intellect which, flowing over and through all the world's ways, alone promises that clearness of vision by which we can walk in the labyrinthine ways of crowding passions, necessities and duties.

But it is in the world of earth's verdure that man's daily life is cast, and among which he builds his home. This, with its cultivation and shade, its fruitage and various sustenance gives him occupation and rest, food and contentment. So in our psychological analogics, green may stand as the every-day color of general back-ground, of labor, of use, of home-life, peace and rest.

brave *had* the fair, is much truer than that only they *deserved* the fair. The passions, therefore, which stir the blood and heart of men to action, the emotions of honor, vengeance, valor, love, friendship, protection,[2] etc., etc., — these are the fitting

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[1] Hargraves Jennings and his Rosicrucians would find a not unjustifiable connection between love and a "blood-covenant," which at recurrent lunations has emphasized the underlying unity of these two great passions, before the phallic worship at the roots of all primitive faiths had passed into multitudinous rite and symbol.

[2] Reference to Trumbull's book must again be made for clearer explication of the words.

Lastly, how appositely blue represents the spiritual life of duty and religion! Blue, derived from the changeless deeps of the arching sky, — overcast, perhaps, for a time, by the passing clouds or mists of mundane change and chance, but always still there, the same forever, the same by day or by night, distant and yet constantly watching over us, impersonal, yet ever in touch with our strongest passions and humblest utilities.

THE AMERICAN OPHTHALMOLOGICAL SOCIETY.

The twenty-second annual meeting of the society was held at the Pequot House, New London, Conn., July 21 and 22, 1886.

First Day. — Morning Session.

The meeting was called to order by the president Dr. William F. Norris, of Philadelphia.

A business committee consisting of Drs. E. Gruening and S. D. Risley, was appointed.

A communication with reference to the organization of a Congress of American Physicians and Surgeons, was read and referred to a committee, with instructions to report at the present session.

Dr. Peters, of New York, Dr. Hubbel, of Buffalo, Dr. E. Friedenburg, of New York, and Dr. Cutter, of New York, were invited to take part in the discussions of the society.

Dr. H. Knapp, of New York, read a paper on

Pyogenic Micro-Organisms, with Demonstrations and Experiments.

Dr. Knapp made some general remarks with reference to the dependence of suppuration on certain kinds of micro-organisms. the pyogenic bacteria, of which pure cultures had been obtained during the past two years. He exhibited these bacteria in numerous test-tube specimens on agar-agar and also under the microscope. He also exhibited slides of different tissues of the eyes that had been infected with these germs. He showed two rabbits which he had operated on for cataract the day before, in the presence of members of the society. Extraction had been made on the left eyes with clean instruments, and the right eyes with instruments contaminated with staphylococcus pyogenus aureus. The left eyes were free from secretion. The wound of one eye in a doubtful, the other in a good condition, whereas the right eyes discharged matter profusely, and were in a state of intense destructive inflammation. He then operated on two other rabbits in the same way. The four rabbits were examined the next day. The right eyes in all were suppurating; the wounds of the left eyes in three of the rabbits were in good condition. In one of the first two rabbits, it was suppurating. This eye had become infected from the right eye of the other rabbit. They had been kept together in the same box, and the operator had found them with their heads in contact.

These demonstrations were made to draw the attention of the members to this new and important field of inquiry, and the speaker stated that he would be happy to furnish cultures of these organisms to any one who intended to make investigations in this department.

In reply to a question as to the best method of cleaning instruments, Dr. Knapp said that in the institutions in Europe, the instruments are placed in an antiseptic solution. This, however, has the disadvantage of dulling the edge of cutting instruments. His experience has shown him that the simple washing with water in the case of smooth instruments, followed by friction with a clean towel, renders them bacteriologically clean. Where an instrument has a groove, or is at all rough, it is much more difficult to clean. Instruments like forceps may be put in the antiseptic solution. It must be remembered that in the majority of operations, a certain quantity of infecting material is required to produce any effect. Where there is a free escape of liquid from the wound, the material is washed off, but where there is a sucking-in process, the danger is much greater.

Dr. B. E. Fryer, of Kansas City, called attention to hydronapthol, which has lately come into use, which would probably not interfere with the edge of cutting instruments. It has, however, not been sufficiently long under observation to enable us to say whether it will completely sterilize instruments. It had also occurred to him that chloroform would probably perfectly sterilize instruments.

Dr. Hubbel, of Buffalo, asked Dr. Knapp, if there are not certain conditions of the eye which would favor infection of the wound after operation. He had recently operated on a case of cataract in a man sixty years of age, where there had been a long standing purulent inflammation of both conjunctivæ. He performed an iridectomy, following it in two weeks, with extraction. Both operations were entirely successful and without accident, notwithstanding the fact that there was a constant purulent discharge. The only antiseptic used was a solution of boracic acid.

Dr. H. Knapp, in reply, said that he thought that a lachrymal discharge with a certain amount of conjunctivitis furnishes a favorable soil for the growth of bacteria. In operating in such cases, the discharge should be complely removed. As he had already, said a certain quantity of the pathogenic bacteria are required to produce infection. He had pricked the cornea to one-third or two thirds of its depth, and covered the wound with an emulsion of the bacteria, yet in only one out of every four or five did abscess develop.

Dr. J. A. Andrews, of New York, said that he had frequently pricked the cornea and applied the staphylococcus pyogenus aureus and had repeatedly seen recovery follow without suppuration or inflammation. Mere contact of the microbe with the wound is not always sufficient to produce suppuration, especially in the case of the cornea where the discharge is liable to be washed off. Where the material has been introduced into the wound and kept there for a short time, he had never seen a failure.

In the cleaning of instruments he uses what he terms "aseptic fluid." He procures clean water, and boils it for some time. The principal value of antiseptic solutions in hospitals is, he thought, the fact that they furnish something you are sure is clean. The water is not always clean. He did not mean to be understood as saying that he used boiling water. He boiled the water simply to render it aseptic.

AN ANALYSIS OF ONE HUNDRED CASES OF EXUDATIVE RETINITIS OCCURRING IN THE COURSE OF BRIGHT'S DISEASE.

BY DR. C. S. BULL, OF NEW YORK.

Only such cases were included in the report as had been examined by the writer, and had been followed to their termination. All cases due to scarlatina or pregnancy were excluded. Out of five hundred cases examined only one hundred and three fulfilled these conditions. The ophthalmoscopic examinations were made by the author. and the urine was always examined. In fifty-four of the cases, both eyes were affected when the patient came under observation. and in ninety-three per cent both eyes were ultimatey involved. Hæmorrhages occurred in sixty-nine cases. In thirty-four cases. there were no hæmorrhages. The hæmorrhages were intimately connected with disease of the blood vessels. Only one instance of color affection was observed.

The prognosis with reference to the duration of life is very unfavorable. The one hundred and thirteen cases reported were collected during a period of thirteen years. Of this number eighty-six have died ; fifty-seven during the first year and twelve during the second year. Of the seventeen still living, fourteen were seen in the last six months. One of these cases, however, was seen for the first time seven years ago.

A rather unusual complication was seen in four of the cases, that was the presence of sugar as well as albumen in the urine. The amount of sugar was variable.

DISCUSSION.

Dr. E. Greuning, of New York, said that he had collected over one hundred cases of this affection and he found that none of his cases had lived over two years after the diagnosis of retinitis albuminurica had been made. In this class of cases he included only those in which the typical stellate changes were seen in the maculæ of both eyes. He had lately seen this appearance in the macula of one eye, in a patient who presents no evidence of Bright's disease. This is the first time that he had seen this change without signs of renal disease.

Dr. B. E. Fryer, of Kansas City, remarked that in these cases albumen is occasionally absent from the urine for a short time. In two such cases he had found that albuminosis was present during the time that albumen was wanting.

Dr. David Webster, of New York, said that he was satisfied that in rare instances these patients do recover their general health. and may live indefinitely. Some years ago he examined the eyes of a clergyman and found the typical appearances of retinitis Brightii. This patient had been examined fifteen years previously by a competent observer, who found the same condition, and also found albumen and casts in the urine. He had the urine examined and found a slight trace of albumen.

Dr. O. F. Wadsworth, of Boston, said that where the retinitis albuminurica comes on during or immediately after pregnancy he had seen the stellate spots in the maculæ entirely disappear. He had also seen typical stellate deposits in cerebral tumor, and what was supposed to be meningitis, but in which there was no albuminuria.

Dr. E. Greuning, of New York, remarked that the cases of retinitis Brightii which we see in our offices, differ very materially from those which we see in hospitals. The patients who consult the oculist are usually those with the small contracted kidney, while the patients with the large white kidney find their way to the hospital.

Dr. C. S. Bull, of New York, desired simply to repeat what he said in his paper, that he had excluded all cases where the albuminuric retinitis was due to scarlet fever or to pregnancy. He did not hold that the so-called stellate exudation in the region of the macula is typical of Bright's disease. He had seen it in intra-cranial tumor, and in cases supposed to be meningitis. Retinal exudation, other than stellate, he had seen not infrequently in cases of large white kidney.

THROMBOSIS AND PERI-VASCULITIS OF THE RETINAL VESSELS.

BY DR. GEORGE C. HARLAN, OF PHILADELPHIA.

Mrs, F. B., age 33 years, came under observation June 5, 1886. Her father and a younger sister had died of Bright's disease, the mother of paralysis. During the past two years, she had had considerable headache. She had a miscarriage in July, 1885, from which her recovery was delayed. She had a second miscarriage without special trouble, in January, 1886. There was no trouble with the eyes until May 7, when she noticed dimness of vision in the left eye. This increased during the day and the following morning there was only light perception in this eye. She was examined two weeks later by a surgeon who pronounced the condition one of embolism. There was no suspicion of specific disease, There was no uterine trouble, and the heart sounds were normal. The urine had a specific gravity of 1009, contained some albumen, but no true casts were found. Examination of the eyes showed no light-perception in the left eye. The media were clear there were hæmorrhages scattered through the retina. Some were striated, extending in long streaks along the vessels. There were three groups of white spots at the macula. With one exception, all the vessels of the retina were converted into white bands. The exception was a small artery having an independent origin. The vessels were of nearly normal size. Five or six weeks later, the hæmorrhages had been absorbed, but there were no other changes. In the right eye there were several small hæmorrhages and two filmy white patches; these subsequently disappeared. In July she had a slight attack of paralysis on the left side, and examination of the urine showed some albumen and hyaline tube casts. The rapid on-set and the occurrence of blindness within a few hours, seemed to exclude the possibility of disease of the vessels. Embolism would not account for the condition. The speaker suggested that the partial blindness for the first few hours was due to hæmorrhage, and that the complete blindness coming on later was due to thrombosis. Thrombosis of a whole series of vessels is, however, rare. Another probable explanation is that there had been for some time, disease progressing in the outer walls of the vessels, without giving rise to sufficient disturbance of vision to attract attention.

By way of comparison a second case was described in which the affection seemed to be a perivasculitis. It was that of a negro woman who had been partially blind for a long time. The right eye was the seat of a dense cataract. In the left eye $V = \frac{20}{c}$. The lens was hazy and the disk pale. Extending upward there was a large artery converted into a chalky band; two smaller arteries exhibited the same condition in places.

A NEW TEST TYPE.

BY DR. WM. S. DENNETT, OF NEW YORK.

The speaker called attention to the fact that although for twenty-five years, the schools of the civilized world had been under the observation of oculists, who all agree that great good would be done by periodical examination of the eyes of scholars, and although such examinations were very simple, the internal inertia of existing institutions had always prevented any continued action on the part of the schools. Among the laity there is absolutely no knowledge of what normal eyes should be expected to see. A card was presented which was designed for the use of educational institutions. It contained one set of letters and a statement of the exact distance at which these letters should be seen. The desire was expressed that this or some similar card should be placed on the wall of every school room, in a conspicuous place, so that it should become of necessity a familiar object and a standard of measurement that would be remembered through life.

THE POSSIBLE RETARDATION OF RETINTIIS PIGMENTOSA IN THE YOUNG.

BY DR. HASKET DERBY, OF BOSTON.

This affection is, as a rule, considered incurable, leading gradually to complete blindness. In America this disease is exceedingly in-frequent, the author having seen it but twenty-seven times in thirteen thousand eye cases. In 1881 a boy three years of age, was brought to him from Virginia. It was observed that toward night his vision diminished. There was no history of blindness in the family. Five years later he came again accompanied by his sister, seven years of age. Both children were night-blind and presented the evidences of retinitis pigmentosa. Under the use of the constant current there was improvement. A similar case of improvement under the use of the constant current, under the care of Dr. Standish, was reported.

The object of the paper was to invite discussion as to the use or non-use of such eyes for educational purposes, and as to the possibility of adopting measures for delaying the process of the organic change.

A third case, that of G. W., aged fourteen, was described. He presented the typical appearances of retinitis pigmentosa. Non-use of the eyes and the application of the constant current was recommended. He was subsequently advised, by others, to use the eyes freely. In five years vision diminished from three-tenths to one-tenth. This rapid progress of the disease, it was thought, might have been aided by the use to which the eyes had been subjected.

Discussion.

Dr. William S. Little, of Philadelphia, had observed in one case of retinitis pigmentosa occurring in a deaf mute decided improvement in vision under the use of the Faradaic current. The improvement continued for two years without change. He then went West and seven years after the applications he was doing well, but could not see quite as well at night as before.

In two cases coming to the Jefferson College clinic, the pigmentation had proceeded so far that the vitreous was also black. This he had never seen before.

Dr. L. Webster Fox, of Philadelphia, said that he had had the opportunity of treating a number of cases successfully. He had found that it was the negative pole that produces the good results. He also stated that if there was no enlargement of the field, after three applications, improvement was not to be expected. In all the cases in which improvement took place the blood vessels seemed to increase in calibre, and the night blindness correspondingly diminished.

Dr. George C. Harlan, of Philadelphia, remarked that he had recently seen two well marked cases of this affection, one in a boy of seventeen years of age and the other in his sister a few years older. His faith in any form of treatment being weak, he recommended that the best use be made of the eyes while sight remained. From the cases which he had seen, he thought that there is likely to be a culmination of the disease about puberty.

Dr. George Strawbridge, of Philadelphia, stated that he had tried the use of electricity in this affection thoroughly, some ten years ago. He did not obtain benefit in a single instance. He placed more reliance upon the occasional use of alteratives such as bichloride of mercury and iodide of potassium, looking upon these cases as of syphilitic origin, probably dating back a long period.

Dr. Samuel Theobald, of Baltimore, had had no experience with the use of electricity in retinitis pigmentosa. He had, however, seen temporary improvement from the continued use of phosphate of iron, quinia, and strychnia. One of these cases was seen when eight years of age, some ten years ago. He retains sufficient vision to enable him to perform his duties as a traveling salesman. There was a history of a similar trouble in other members of the family.

Dr. S. G. Risley, of Philadelphia, said that it had seemed to him that with the hypodermic use of strychnia he had secured improvement in the general sharpness of vision. He had frequently seen improvement follow the use of this drug, but it had never been permanent. As regards the age at which this affliction may develope, he had seen it in two children of the same family occur under five years of age.

He mentioned another case, that of a young man who consulted him with retinitis pigmentosa, with marked contraction of the field and asthenopia, principally due to hypermetropic astigmatism. To relieve the asthenopia a weak solution of eserine was ordered. Under its use vision decidedly improved. He had used this solution more or less for the past two years, and finds that when he is without it he is distinctly more uncomfortable.

Dr. O. F. Wadsworth, of Boston, referred to one case which, in connection with those reported, showed the variable course which the disease may pursue when left to itself. A young man, twenty-four years of age, a divinity student, was seen in 1873, presenting the typical appearance of retinitis pigmentosa. He had well marked night-blindness. He continued his work, and eight years later, vision was about the same, but the visual field seemed to have decreased to a slight extent.

THE EQUIVALENCE OF CYLINDRICAL AND SPHERO-CYLINDRICAL LENSES.

BY DR. EDWARD JACKSON, of Philadelphia.

The paper was intended to demonstrate the laws of such equivalence, showing that equal crossed cylindrical lenses are optically equivalent to a spherical lens of the same refractive power. Crossed cylinders of unequal refractive power may be regarded as crossed cylinders of equal refractive power combined with a third cylindrical lens, or as their equivalent, a spherical combined with a cylindrical lens. It was proven that any two cylindrical lenses with their axes placed obliquely, the one to the other, might be represented by crossed cylinders, that is, cylinders with their axes perpendicular to one another, or by their equivalent in the shape of a sphero-cylindrical lens. Hence that any number of cylindrical lenses with their axes placed in different directions, are optically equivalent to a single sphero-cylindrical lens. To determine the sphero-cylindrical equivalent of any two cylindrical lenses, construct a parallelogram, two sides of which are proportional to the refractive power of the given lenses, the angle included by these axes being double the angle made by their axes. Then the diagonal which cuts this included angle will be proportional to the cylindrical portion of the desired equivalent, and to get the spherical portion, it is only necessary to subtract one half of this cylindrical equivalent from half the sum of the cylinders given.

DISCUSSION.

Dr. William S. Little, Philadelphia, said with reference to the practical side of the question, that in about one half of his cases of mixed astigmatism, the patients have preferred crossed cylinders to their equivalent sphero-cylinder. In using a sphero-cylinder, it is essential that it be accurately centered.

The committee to whom was referred the consideration of the proposition with reference to the organization of a Congress of American Physicians and Surgeons, reported the following resolutions and recommended their adoption :

Resolved, that a committee of five be appointed by this society and be authorized to confer with committees from other medical societies, with regard to the organization of a convention or congress of such societies, and report at the next meeting of this society.

Resolved, That it is the sense of this society that its welfare would be put in peril by any alliance or cooperation which would interfere with its autonomy or independent meeting.

These resolutions were adopted, and the following committee subsequently appointed:

O. F. Wadsworth, Boston; C. S. Bull, New York; George C. Harlan, Philadelphia; Samuel Theobald, Baltimore; and B. E. Fryer, Kansas City.

[TO BE CONTINUED.]

ONE HUNDRED AND TWENTY CASES OF ANÆMIC AND ATROPHIC CONDITION OF THE OPTIC AND RETINA.—BY ADOLF ALT, M. D.

(Table No. 1, Continued from Page 215).

No.	*Name and Age.*	*Cause.*	*Pupils.*	*Ophthalmoscopic Appearance.*	*Color perception.*	*Visual field*	*Visual acuity.*	*Treatment.*	*Time of observation.*	*Result.*	*One Eye.*	*Both Eyes*	*Remarks.*
71	A. B. 36.	Tobacco.		Discs pale; arteries threadlike.		Central scotoma both.	$^{20}/_{50}$ Both.	Abstinence strychnia intern.	2 months.	$^{20}/_{20}$ Both.		1	Never drank any alcoholic drink.
72	Miss B.D. 12.	Congenital.		Discs white; bloodvessels very small.			$^{20}/_{200}$ Both					1	Microphthalmus; divergent strabismus; nystagmus.
73	C. D. 17.	Congenital.		Pale discs.			$^{20}/_{200}$ Both.					1	Brother of former; M. 1-8.
74	Dr. H. G. 43.	Tobacco & tabes dorsalis.	Myosis. Both.	Whitish discs; arteries small.	Red-green-blind.	Concentrically limited, both; central scotoma both.	$^{8}/_{200}$ Both.	Abstin arg nitr.; electricity; Thermo-cautery to spine; cold douche on spine.	Off and on.	Stationary.		1	No tendon reflex; had crises gastriques; sense of balance disturbed; loss of memory; spinal symptoms very greatly improved by treatment.
75	Mrs. D, 35	General anæmia.		Pale discs; small bloodvessels.			R. $^{20}/_{40}$ L. $^{20}/_{30}$	Strychnia and ferrum inter.	1 year.	$^{20}/_{20}$ with glasses.		1	Myopic astigmatism.

76	P. A. H. 29.	Tobacco; onanism; general debility.		Whitish discs.		Concentrically limited and central scotoma.	R. $^{20}/_{100}$ L. $^{20}/_{70}$	Abstinence; strychnia subcut. cold sitz baths; cold douche to spine.	2 months.	R. $^{20}/_{50}$ L. $^{20}/_{20}$		1	Emission of semen at the slightest provocation, even during work. Watchmaker.
77	D. H. B. 36.	Retinitis pigmentosa.	Mydriasis	White discs; perivasculitis.		Concentrically limited.	R. $^{18}/_{200}$ L $^{20}/_{200}$					1	Hemeralopia.
78	Mrs. A. P. 27.	General anæmia.		Whitish discs; blood vessels small.			$^{20}/_{50}$ Both.	Strychn. intern.	Seen once only.			1	H. 1-7.
79	H. H. 48.	Alcohol and tobacco.		Pale discs.		Central scotomata.	$^{20}/_{30}$ Both.	Abstinence; strychnia intern. advised.	Seen once only.			1	Saloon-keeper; refuses to abstain.
80	M. S. 54.	Alcohol and tobacco and syphilis		White discs; blood vessels very thin.	Red-green-blind.		R. $^{12}/_{200}$ L. $^{4}/_{200}$	Abstinence sublimate.	Seen once only.			1	Teamster.
81	R. F. 41.	Alcohol and tobacco.		Discs whitish; arteries small.		Central scotoma.	R. $^{20}/_{200}$ L. $^{20}/_{50}$	Abstinence; strychnia subcut.; later ferrum and potass. iodid.	2 months.	R. $^{20}/_{70}$ L. $^{20}/_{40}$		1	Saloon-keeper.

TABLE NO. 1. *Continued.*

No.	*Name and Age.*	*Cause.*	*Pupils.*	*Ophthalmoscopic appearance.*	*Color perception.*	*Visual field.*	*Visual acuity.*	*Treatment.*	*Time of observation.*	*Result.*	*One Eye.*	*Both Eyes*	*Remarks.*
82	P. A. H. 26.	Alcohol and tobacco.		R. disc white.	R. impaired.	R. small central scotoma.	R. $^{20}/_{50}$	Abstinence; strychnia intern.	Seen once only.		1		Whisky dealer; L. anterior phthisis.
83	T. B. 14.	Central lesion; (cerebro-spinal. meningitis).	R. Mydriasis.	White discs, especially R.; arteries small.			R. $^{2}/_{200}$ L. $^{20}/_{70}$		Seen in consultation.			1	Had cerebro-spinal meningitis 6 years previously; said to have been blind altogether.
84	T. M. 24.	Alcohol and tobacco.		Very pale discs, especially inner halves.		Central scotoma.	$^{20}/_{50}$? Both.	Abstinence strychnia intern. brom. pot. and iod. pot.	3 months.	$^{20}/_{20}$		1	Saloon-keeper.
85	H. S. 51.	Injury.		L. disc almost white; bloodvessels small.		Concentrically limited, L.	R. $^{20}/_{30}$ L. $^{20}/_{100}$	Strychnia intern.	Seen in consultation.		1		Fell from a high wagon on his left side; was insensible for some time, and bled from left nostril for several days.
86	L. R. 15.	Scrophulosis.		R. whitish disc; small bloodvessels. L. almost normal.		Limited downwards and inwards.	R. $^{20}/_{100}$ L. $^{20}/_{50}$	Strychnia intern. pot. iod.	8 months.	R. $^{20}/_{50}$ L. $^{20}/_{30}$		1	About three months previouslynoticed suddenly that he could not see at all with R; was then treated with the constant cur-

													rent and improved to 20-100, which remained stationary; stricture of L. lachrymal duct.
87	H. E. 24.	Syphilis.		Pale discs.			$^{20}/_{30}$? Both.	Sublimate.	Seen only once.			1	
88	B. F. 49.	Unknown		White disc in R.			R. $^{4}/_{200}$		Seen in consultation.				Got blind 10 years previously.
89	B. S. 77.	Old age.	Myosis.	White discs.	Blue-yellow blind.		$^{12}/_{200}$ Both.	Strychnia intern.; stimulants.	Seen in consultation.	Increasing failure.		1	
90	Mrs. F. B. 46.	Syphilis.		R. white disc; blood-vessels small; L. neuritis optica.		Constricted to point of fixation R.	R. $^{10}/_{200}$	Strychn. subcut; ung. ciner. pilocarp. mur. subcut.; Hydrarg. tannicum.	3 months	unchanged.		1	R. operated upon for glaucoma simplex four years previously; no excavation; macula corneæ both; Ah. both.
91	H. H. J. 34.	Alcohol and tobacco.		Pale discs.		Central scotomata.	R. $^{20}/_{200}$ L. $^{12}/_{200}$	Abstinence advised.			1		Refuses to abstain.

TABLE No. 1 *Continned.*

No.	*Name and Age.*	*Cause.*	*Pupils.*	*Ophthalmoscopic appearance.*	*Color perception.*	*Visual field.*	*Visual acuity.*	*Treatment.*	*Time of observation.*	*Result.*	*One Eye.*	*Both Eyes*	*Remarks.*
92	J. W T. 34.	Alcohol.		Discs very pale; arteries threadlike.		Central scotomata.	$^{20}/_{30}$? Both.	Abstinence advised.				1	Refuses to abstain; never smoked.
93	A. M. 48.	Central lesion; (tabes dorsalis)	Unequal.	Pale discs and thin arteries.		Concentrically limited.	R. $^{20}/_{70}$ L. $^{20}/_{100}$		Seen in consultation.			1	Died soon after.
94	M. K. 46.	Alcohol and tobacco.	L. sluggish.	Pale discs; arteries threadlike.		Central scotomata.	R. $^{18}/_{200}$ L. $^{20}/_{200}$	Strychnia sub cut.; hydrarg. tannic.; cold douche; pot. brom. abstinence.	2 months.	R. $^{20}/_{70}$ L. $^{20}/_{70}$?		1	In the liquor business.
95	F. R. F. 44.	Probably central lesion.		Discs pale; arteries thin.			$^{20}/_{40}$ Both.		Seen in consultation.			1	
96	S. K. 23.	Central lesion (myelitis spinalis).	R. Mydriasis.	White discs, especially R.		Concentrically limited, both.	R. $^{10}/_{200}$ L. $^{15}/_{200}$		Seen in consultation.			1	Fell from railway car; injury to spine; incessant headache.

97	C. K. 45.	Alcohol and tobacco.		Arteries very thin discs pale.			$^{20}/_{200}$ Both.	Abstinence advised.	Seen once only.			I	Refuses to abstain.
98	E. C. 16.	Doubtful.		Outlines of disc L. hazy; arteries small; veins thinner than in R.		Concentrically limited.	L. $^{20}/_{50}$	Pot. iodid.	6 weeks.	L. $^{20}/_{20}$	I		
99	F. Y. 47.	Pressure from tumor of lachrymal gland; L.		L. disc white.			$\frac{1}{\infty}$	Removal of tumor and eyeball.	8 months.	Death.	I		Spindle cell sarcoma of lachrymal gland; general sarcomatosis.
100	J. G. 62.	Tobacco.		L. disc perfectly white; arteries hardly visible. R. disc pale; bloodvessels threadlike.		Restricted in- and downw'ds	R. $^{20}/_{100}$ L=0	Strychnia subcut.	Seen once only.			I	Never used alcohol.
101	Miss J. F. 25.	Neuritis optica; probably intacranial tumor.	Mydriasis both.	R. disc pale; outlines indistinct; newly formed bloodvessels. L. disc white; arteries small.			=0 Both.		Seen in consultation.			I	Continued localized headaches and attacks of dizziness.

TABLE No. 1. *Continued.*

No.	*Name and Age.*	*Cause.*	*Pupils.*	*Ophthalmoscopic appearance.*	*Color perception.*	*Visual field.*	*Visual acuity.*	*Treatment.*	*Time of Observation.*	*Result.*	*One Eye.*	*Both Eyes.*	*Remarks.*
102	W. S. 36.	Cold ?	L. Mydriasis.	L. atrophic choroiditis; white disc, small bloodvessels; R. pale disc.			R. $^{20}/_{40}$ L. $^{10}/_{200}$	Sublimate.	Seen once only.			1	Fell into river during December; was rescued after several hours only and dates eye affection from that time.
103	J. S. 15.	Scarlet fever; uræmia; optic neuritis.	Medium wide; inactive.	Discs pale; bloodvessels thin.		Central scotomata.	R. $^{20}/_{100}$ L. $^{20}/_{70}$	Strychnia subcut.	5 weeks.	$^{20}/_{20}$ Both.		1	
104	C. C. S. 35.	Alcohol and tobacco.		Discs pale; arteries small.		Central scotoma, R.	R. $^{20}/_{50}$ L. $^{6}/_{200}$	Strychnia subcut.	6 weeks.	R. $^{20}/_{20}$ L. $^{16}/_{200}$		1	Blacksmith.
105	J. K. 43.	Alcohol and tobacco.	R Mydriasis.	Whitish discs; arteries small		Concentrically restricted, both; central scotomata.	$^{18}/_{200}$ Both.	Strychnia subcut.; pot. brom.	3 weeks.	$^{20}/_{70}$ Both.		1	
106	F. W. W. 58.	Tobacco.	Myosis.	Whitish discs; bloodvessels small.	Red-green blind.	Central scotomata.	$^{16}/_{200}$ Both.	Strychnia subcutan.	8 months.	$^{20}/_{30}$ Both.		1	Never used alcohol.
107	Ph. B. 53.	Alcohol		Pale discs; arte-			R. $^{20}/_{50}$	Strychnia	3 months.	$^{20}/_{30}$		1	Married again three

		and tobacco; excessive sexual intercourse.		ries small.			L. $^{20}/_{70}$	intern. abstinence.		Both			weeks ago; noticed failure of sight since then; liquor-dealer.
108	K. C. 44.	Alcohol and tobacco.		Discs reddish; bloodvessels very thin.		Central scotomata.	$^{20}/_{30}$? Both.	Strychnia subcut.	10 days.	$^{20}/_{20}$ Easily.		1	After inj. of strychn. subnitr., gr. 1–14; sees 20–20.
109	Miss M.C. 59.	Unknown		Discs pale; arteries small.			R. $^{20}/_{70}$ L. $^{20}/_{70}$?	Strychnia advised.	Seen in consultation.			1	H. 1-40.
110	J. S. W. 50.	Alcohol and tobacco (p'rh'ps central)	Myosis.	Discs pale.	Green-blind.		$^{20}/_{100}$? Both.	Strychnia advised.	Seen once only.			1	After injection of strychn. subnitr. gr. 1-10; sees 20-50. No patellar reflex.
111	E. P. 13.	Central lesion (cerebro-spinal meningitis.)	R Mydriasis.	Discs white; R. bloodvessels almost invisible; L. bloadvessels threadlike.	Green-blind.	L. contracted almost to point of fixation	R=0 L. $^{7}/_{200}$		Seen in consultation.			1	Had three distinct attacks of cerebro-spinal meningitis.
112	W. A G. 34.	Syphilis.		Discs reddish; arteries and veins verysmall.			$^{20}/_{50}$? Both.	Potass. iod.; Strychnia subcut. advised.	Seen in consultation.			1	Had been' under anti-syphilitic treatment for two years.

TABLE No. 1. *Continued.*

	Name and Age.	*Cause.*	*Pupils.*	*Ophthalmoscopic appearance.*	*Color perception.*	*Visual field.*	*Visual acuity.*	*Treatment.*	*Time of observation.*	*Result.*	*One Eye.*	*Both Eyes.*	*Remarks.*
113	J. P. L. 12.	Congenital.		Post. scleral; staphyloma both; discs white; L. choroidal atrophy.			R. $^{14}/_{200}$ L. $^{12}/_{200}$		Seen once			1	M. 1-12.
114	Mrs. Th. P. 49.	Unknown		Discs pale; arteries thin; post staphyloma.			R. $^{20}/_{50}$ L. $^{20}/_{70}$	Strychnia intern.	2 weeks.	$^{20}/_{30}$ Both.		1	M. 1-18.
115	Mrs. A. S. 85.	Old age.		Discs white; bloodvessels hardly visible.			R. $^{20}/_{70}$? L=0	Strychnia intern and stimul'nts advised.	Seen in consultation.	Increasing failure.		1	
116	W. H. 48.	Alcohol and tobacco.		Discs whitish; bloodvessels thin.	Red-green blind.	Central scotomata.	R. $^{20}/_{40}$ L. $^{20}/_{100}$	Strychnia subcut.	3 weeks.	R. $^{20}/_{20}$? L. $^{20}/_{30}$?		1	After injection of strychnia subnitr. gr. 1-10; vision rose to 20-40?
117	Mrs. K.R. 71.	Old age.		Discs white; bloodvessels thin.			R. $^{16}/_{200}$ L. $^{20}/_{200}$	Strychnia and stimulants advised.	Seen once only.			1	Strychnia subcut.; gr. 1-20 had no effect.

118	Th. S. 58.	Tobacco.		Discs pale, especially in outer halves; arteries thin.	Red-green blind.	Central scotomata.	R. $^{8}/_{200}$ L. $^{4}/_{200}$ Excentric fixation.	Strychnia subcut.; pot. iod.; sublimat.	4 months.	$^{20}/_{100}$ Both.		1	After injection of gr. 1-10 strychnia subnitr. vision rose to R. 18-200 and L. 10-200; dyspepsia.
119	F. W. S. 57.	Alcohol and tobacco.		Discs whitish; bloodvessels threadlike.			R. $^{20}/_{200}$ L. $^{14}/_{200}$	Strychnia subcut. advised and abstinence.	Seen once only.			1	Refuses to abstain; no patellar reflex.
120	Miss K. Mc. 12.	Central lesion; (probably meningitis cerebralis.	Immovable.	Discs white; bloodvessels thin.			V=0	Strychnia subcut.; constant current.	2 months.	$V=\frac{1}{\infty}$ Sees big objects as shadows.		1	Came on gradually with vomiting, fever and headache.

Of these 120 cases 95 were observed in males, and 25 in females.

The different causes to which the atrophic condition of the optic nerve was due are given in Table II.

TABLE II.

Alcohol and tobacco	34
Alcohol alone	3
Tobacco alone	7
Alcohol, tobacco and central lesion	1
Alcohol, tobacco and syphilis	3
Alcohol, tobacco and injury	1
Alcohol, tobacco and excessive sexual intercourse	1
Tobacco and insolation	1
Tobacco and central lesion	1
Tobacco, onanism and general debility	1
Central lesion	16
Syphilis	9
Congenital syphilis	1
Injury	6
Pressure from orbital tumor	2
Optic neuritis from unknown cause	1
Optic neuritis from uræmia in scarlet fever	1
Old age	5
Congenital	3
Insolation	1
General anæmia	3
Scrofulosis	1
Cold (?)	1
Sympathetic (?)	1
Cholera, Asiatica	1
Uterine affection	1
Cosmetics	1
Retinitis pigmentosa	1
Unknown	12
Total	120

In the following nineteen cases a central (cerebral or spinal) lesion was found to be present.

TABLE III.

Probably intra-cranial tumor	3
Cerebro-spinal meningitis	3
Cerebral meningitis	1
Tabes dorsalis	2
Tabes dorsalis with tobacco	1
Tabes dorsalis with alcohol and tobacco	1
Tabes dorsalis and syphilis	1
Multiple sclerosis	1
Cerebral apoplexy	1

Epilepsy	1
Softening of the brain	1
Spinal myelitis (traumatic)	1
Unknown central lesion	2
Total	19

If we add to these the cases of atrophy of the optic nerve, due to syphilis, which must probably all be considered as due to a central lesion (9), we have a total of twenty-eight cases of atrophy dependent on a distinct central lesion.

By far the largest number of cases were due to the intoxication with alcohol and tobacco, either alone or combined, or, in some cases, complicated with other affections. The following are the details of this number:

Alcohol and tobacco	34
Alcohol and tobacco with syphilis	3
Alcohol and tobacco with injury	1
Alcohol and tobacco with excessive sexual intercourse	1
Alcohol alone	3
Tobacco alone	7
Tobacco with insolation	1
Tobacco with onanism and general debility	1

This gives a total of 51 cases in which alcohol and tobacco, either alone or combined, played a role. In 44 of these cases alcohol and tobacco were the only cause to be found for the atrophic condition of the optic nerve.

As to the age of the patients, the details may be seen from Table IV.

TABLE IV.

From 1 to 10 years	2
" 10 to 20 "	13
" 20 to 30 "	13
" 30 to 40 "	25
" 40 to 50 "	32
" 50 to 60 "	25
" 60 to 70 "	4
" 70 to 80 "	5
" 80 to 90 "	1
Total	120

Both eyes were affected in 98 cases, one eye only in 22 cases. Of these cases 69 were under treatment and observation during periods varying from ten days to several years; in 12 of these only one eye was affected.

Color perception was abolished or impaired in 27 of all the cases, and red-green blindness was most prevalent.

Central scotoma was observed in 32 cases. In 21 of these cases alcohol and tobacco were the cause; tobacco alone in 5; tobacco and tabes dorsalis in 1; tobacco, onanism and general debility in 1; alcohol alone in 1; uterine affection in 1; uræmic neuritis from scarlet fever in 1; in one case the cause was unknown.

The pupils showed pathological changes not due to synechiæ in 32 of all the cases. They were inactive in 5 cases; unequal (one-sided mydriasis) in 12 cases; both pupils were mydriatic in 8 cases; myosis was found in 7 of the cases.

Of these seven cases of myosis 3 suffered from tabes dorsalis; one from multiple sclerosis; old age and tobacco alone figured each in one case as the only cause to be detected; and in one case there was a combination of a central lesion with the abuse of alcohol and tobacco.

Contrary to Minor's idea, that in the so-called tobacco amblyopia, tobacco plays no part, since *eight* cases of his improved in spite of their continuing to smoke, I *always* insist in such cases upon *total* abstinence; and I am thoroughly convinced that this is the better way, since I have seen a number of cases beginning to improve only when the patients really abstained totally from the noxious influences. Minor's cases seem to me to prove only that the therapeutic agencies he applied had such a tonic effect on the system of his patients, that they were better able to stand these noxious influences.

In the treatment of all anæmic and atrophic conditions of the optic nerves I have, furthermore, mainly relied upon the use of strychnia. Having formerly once given it up as useless in my hands, I returned to it and found, that, when given more fearlessly and in large enough doses, it well might lead to improvements as had been claimed for it by its introducer, Nagel, and many after him. It is true that an improvement may in many cases be reached by other remedies, yet never in so rapid, and often astonishing, a manner. It is hardly possible to explain how a drug even when subcutaneously injected, can have so rapid an effect, that sight in some cases after its application may be found to have improved 200 or 300 per cent and even more in the course of five minutes, and yet this does happen and not infrequently so. I have become accustomed to give a very doubtful prognosis in cases of atrophy of the optic nerve in which a trial injection of strychniæ subnitr., gr. $\frac{1}{12}$ or $\frac{1}{15}$ has no effect upon the vision. When vision is somewhat improved after the injection, I increase the dose daily unless the patient complains of headache, dizziness and nausea; and I have in some cases finally injected gr. $\frac{1}{4}$ or even $\frac{1}{3}$ before the patient had any discomfort from it.

A similar treatment has been applied in most of the later cases of the series under consideration and often with a very gratifying and lasting result, and I think it is well to try it in every case for a short period.

In some cases the constant current seemed to act beneficially.

In the cases of congenital atrophy and atrophy from old age, no treatment is apparently of any value.

CORRESPONDENCE.

THE NEW THEORY OF COLOR-PERCEPTION.

WASHINGTON, Aug. 16, 1886.

TO THE EDITOR OF THE AMERICAN JOURNAL OF OPHTHALMOLOGY:

Dear Sir:—There is one paragraph in the interesting and valuable paper by Dr. Fox and Mr. Gould, in the July issue of your JOURNAL, from which a wrong inference might be drawn. They say: (p. 195.)

"Dr. Burnett's reference to Preyer's article in Pflueger's *Archiv* sends us all back to Preyer as the real author of the conception that the retinal function is a refined temperature sense, though so far back as 1877 Pflueger had stated his belief in the phylogenetische Zusammengehoerigkeit des Waerme-und Lichtsinnes."

When the authors wrote this they were acquainted only with my latest utterances on the color question as published in the *Am. Journ. of Med. Science*, for July 1884. With my former publications they were as yet unacquainted; and in order to get this matter as to time of publication set in proper order, I beg leave to state that in 1880 I wrote a paper setting forth the views, substantially, that I now hold, and read it before the Philosophical Society of this city on the 19th of December. An abstract of this paper was published in the *Knapp's Archives* in March, 1881. Preyer's paper did not appear in *Pflueger's Archiv* until May, 1881, so that my publication antedated his by some two months. The original paper as read before the Philosophical Society, was published in full in the *Popular Science Monthly* for May, 1882, and the same ideas were embodied in a lecture at the National Museum, (Saturday Lectures, No. 8) on the 29th of April, 1882. The final summing up, however, was given in the article on "Theories of Color Perception" published in the *Am. Jour. Med. Science*, July, 1884.

It may be proper also to state in this connection, that I never read the whole of Preyer's original article until three weeks ago, my knowledge of it having been obtained through abstracts published in the various journals. With the exception of this point of the analogy of heat and light sensation as manifested through nerves, now having different functions, but originally of the same structure and, probably, function, there is nothing in common in Preyer's views and my own. According to my belief he started out in the proper direction, and pursued it until he came within sight of the truth, and then abruptly turned aside into the devious paths of speculation and unwarrantable physiology and physics.

The analogy of vision and the temperature sense is, however, only a part and the beginning of the basis on which, I believe, the questions of color perception must be wrought out, and I have nowhere seen an approach to such a solution of the question as I have tried to give until the appearance of the paper by Dr. Fox and Mr. Gould.

It should be mentioned, however, that Giraud-Teulon, of Paris, is an earnest opponent of the Young-Helmholtz theory, and inclines strongly to some such explanation as I have given, and has done me the honor to reproduce in his articles a greater part of my paper published in *Knapp's Archives* (see *Annales d'Oculistique*, Jan.–Fev., 1882, pp. 23, 25 and 26; Mars-Avril, p. 124, and *Bull. d. l'Acad. d Méd.*, 46e année, No. 43, 31 Oct., 1882, pp. 1223 and 1230). On the contrary Donders is still a strong adherent to and a stout defender of the Young-Helmholtz theory against all opposition, coming from whatever source it may. His long and laborious articles published of late years in *Graefe's Archiv.* and the *Annales d'Oculistique* are in themselves sufficient evidence of the weakness of his cause, and are quite in contrast to his clear and concise exposition of the laws of refraction and accommodation and their anomalies, which has made him an enduring fame.

But the tide has at last turned, and the current against their impossible theories is so great that the power of tradition, even when supported by the great names of Young, Helmholtz, Donders, and Holmgren, will not be able to withstand it. We must have a theory of color-perception that is in keeping with our present knowledge of the laws of physics and physiology, and the fact that so many observers (Pflueger, Preyer, Fox and Gould and myself) have independently of each other turned their attention in one direction, is a strong indication that that direction is the one in which future investigation should be prosecuted.

Swan M. Burnett.

THE AMERICAN JOURNAL OF
OPHTHALMOLOGY.

VOL. III. OCTOBER, 1886. No. 10.

A CASE OF LEFT LATERAL HOMONYMOUS HEMIANOPIA.

BY B. L. MILLIKIN, M. D.
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Cleveland, Ohio.

The following case has several points of sufficient clinical interest to make its presentation require no apology.

L. A. B., æt. 40, American, physician, married, is of small size, sparely built, and of blond complexion. Until September 1884, had been healthy. Denies ever having had syphilis, occasionally drank, but was not intemperate, used tobacco moderately.

On the first of September, 1884, after an ordinary day's work, during which, however, he had taken some beer, he had a sudden attack of illness, of which he gives the following history:

After retiring at night, and during coition with his wife, he was suddenly attacked with a sharp, severe pain in one side of his head, the right he thinks, in the temporo-frontal region and in the eye-ball itself.

Within five or ten minutes he was seized with purging and vomiting, and while sitting on the chamber, thinks he became unconscious, and does not remember anything that occurred for a week or ten days afterward, except that he had very severe pain in the front of his head and eye. From this time he gradually improved, so that the pain subsided entirely after six weeks or two months, and has never returned since.

His attending physician, who saw him the morning following the attack, corroborates the above account, except with reference to the unconsciousness. At no time was he unconscious, but was quite delirious, it sometimes being difficult to restrain him. His temperature was slightly elevated for a time, his pulse somewhat accelerated, but no decided febrile symptoms were noted. The marked mental disquietude continued for some two or three months, then gradually became less pronounced, but some disturbance has remained until quite recently, and his physician still thinks he is not quite his former self. At no time have there been paralytic or hemianæsthetic manifestations, except thinks there has been some "thickness of speech." His conversation gives no evidence of this at present. During the time of acute illness the only symptom noticed about his eyes was the severe pain in and about the right one. When he began to read again, however, and to go about, he noticed that in reading or writing, a portion of the word would not be seen, and, in walking about, objects to his left side were not distinguished. This condition has not changed since, and it was on this account that he applied for an examination, which was made June 17, 1886.

His condition was noted as follows: General health fair, but nervous and "fidgety." Is able to do his professional work well, has no noticeable disturbance except his inability to see objects to the left side of the fixation point. In each eye $V=\frac{6}{VI}$, accommodation good, can read an indefinite time without discomfort, except what is due to loss of portions of the words. The ophthalmoscope shows both eyes normal and emmetropic, but a deep physiological cup in the left, no changes in the discs or retinæ discoverable. Vessels normal in size and appearance. The field of vision was taken on Prof. McHardy's perimeter, for white, blue, red and green, the test objects being one cm. in diameter. This shows the entire left half of the field of each eye to be wanting, a vertical line about one inch (? Editor) to the left of the fixation point marking the boundary between vision and blindness. In addition to this, the left eye shows some concentric contraction of the remaining field for all colors, and the right, slight contraction for red and green. Pupils have been and are normal in size and reaction, patella—reflex normal, and no evidence of any disturbance of nerve centers, other than those above indicated.

Although vision was not tested during the time of the acute illness, it is more than probable that the loss of the left half of the field of vision has existed from the beginning, as he complained of the same difficulty in reading and walking about, as soon as he recovered sufficiently for either, and there has been no increase in the trouble manifest to the patient himself since.

The interesting clinical questions here, are: What has been the lesion and where is it located?

In looking up the limited amount of literature on the subject of hemianopia at my disposal, I find the causes and seat of the lesion are various. Wolfe[1] states that in the great majority of cases it is due to hæmorrhage, and usually is accompanied with paralysis. It is also often due to tumors, syphilis, and to traumatic causes such as fracture of the skull. Emboli also frequently produce it.

According to the theory of the partial decussation of the optic nerves, it is evident that the lesion must be located behind the chiasm in the course of the optic nerves, but post mortem examinations have variously placed the lesion in the optic tract, the posterior part of the thalamus opticus, the occipital lobe of the brain, etc.

Dr. Seguin[2] reports a case of sudden left lateral hemianopia, accompanied with numbness of one side, passing off shortly. An autopsy, later on, showed an old spot of yellow softening, involving the greater part of the right cuneus, etc., and was due to blocking of the occipital artery. Wilbrandt[3] reports a case of sudden right lateral hemianopia, incomplete at first but becoming absolute shortly, followed several weeks later by apoplexy and hemiparesis. Three years later patient suicided, and autopsy showed disease of the left occipital lobe of the brain.

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[1] Diseases of the Eye, page 299.

[2] *Medical News*, November 14, 1885, page 553.

[3] *Arch. fuer Ophthal.*, XXXI. 3.

A case is reported in Ziemssen's[1] Encyclopædia, in which a post-mortem showed plugging of the artery of the left fossa of Sylvius. There were hemiparesis and aphasia in addition to the hemianopia.

It[2] has been determined that behind the sulcus Rolandi lies a spot in the cortex, injury to which produces lateral hemianopia.

Hirschberg[3] reports a case of right-sided hemianopia with perfect central vision, with no paretic symptoms at first, followed, however, by aphasia and right hemiplegia. Autopsy showed large tumor, causing atrophy of the left optic tract.

Thompson and Keen's case of gunshot wound of occipital lobe of the brain was one of hemianopia without other apparent lesion.

Hughlings-Jackson and Gowers[4] relate a case of double left hemianopia with hemianæsthesia and hemiplegia of the same side. Post-mortem showed disease of the posterior part of the right thalamus opticus.

Curshmann[5] reports a case of complete left hemianopia, in which autopsy disclosed disease of the right occipital lobe.

So far as I am able to discover, cases of homonymous lateral hemianopia without paretic symptoms at some period of their history, are rare, and in those cases I have found the lesion has been in the occipital lobe of the brain, on the side opposite to that of the hemianopia.

Dr. Alt[6] reports a case of right sided hemianopia, incomplete at first, but becoming absolute in a few days. This was the result of a blow on the left side of the head, behind the ear, received several weeks previously, and which was followed by an abscess of the middle ear, with the general symptoms of "loss of memory for words," dizziness, difficulty in walking, etc.

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[1] Encyclopædia Vol. XII. page 796.

[2] Ziemssen's Encyclopædia Vol. XII. page 796.

[3] *Virch. Arch.*, Bd. LXV.

[4] R. L. O. H. R. Vol. VIII. page 330.

[5] *Centralblatt f. Augenheilkunde*, 1879, page 256.

[6] *Amer. Jour. Ophthal.*, Vol. I. page 39 et seq.

Ophthalmoscopic symptoms negative. A post-mortem several weeks afterwards disclosed a large pus cavity at the site of the injury, between the dura-mater and the cranium. There was also an abscess in the substance of the left occipital lobe of the brain close to the angular gyrus.

Dr. Norris[1] from a careful study of the case of gunshot wound reported by Keen and Thompson, and from his observations in the laboratory of Stricker, concludes that cortical lesions of the occipital lobes produce hemianopia.

This conclusion, also, agrees with Munck, who places the visual centres in the occipital lobes, and states that a lesion of one occipital lobe will produce hemianopia of the opposite side. These conclusions are in accordance with the theory of the partial decussation of the optic nerves, a theory, however, which is not accepted by all good observers, but nevertheless, the weight of authority seems to be in its favor.

Taking into consideration the clinical features of our case, in conjunction with those reported and the results of repeated autopsies, the indications seem to point pretty clearly to a lesion, perhaps an embolus, of the right occipital lobe of the brain. On this supposition, however, there is one symptom not easily understood, viz., the reference of severe pain to the orbital region, and the eyeball of the right side. Can this be explained on the general principle that an irritation of a nerve is referred to its terminal extremity?

If this were true, why should it not be referred to the left eye as well as to the right, if the theory of the partial decussation of the optic nerve is a correct one?

Another possible explanation which suggests itself, is, might not there have been an optic neuritis of sufficient severity to produce the symptoms, and the infiltration have been subsequently absorbed away before any permanent nerve lesion was induced.

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[1] Pepper's System of Medicine, Vol. IV. page, 778.

We[1] know that very great œdema of the optic nerve may take place and disappear so rapidly as not to affect the vision permanently or leave distinct ophthalmoscopic evidences afterwards. None of my text books, or the cases I find reported, refer to this symptom of pain in the eye. Of course only an autopsy could determine definitely the nature and seat of the lesion.

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[1] Gower's Medical Ophthalmoscopy, pages 47—56.

REFERENCE CHART OF THE FIELD OF VISION.

BY JAMES L. MINOR, M. D., MEMPHIS, TENN.

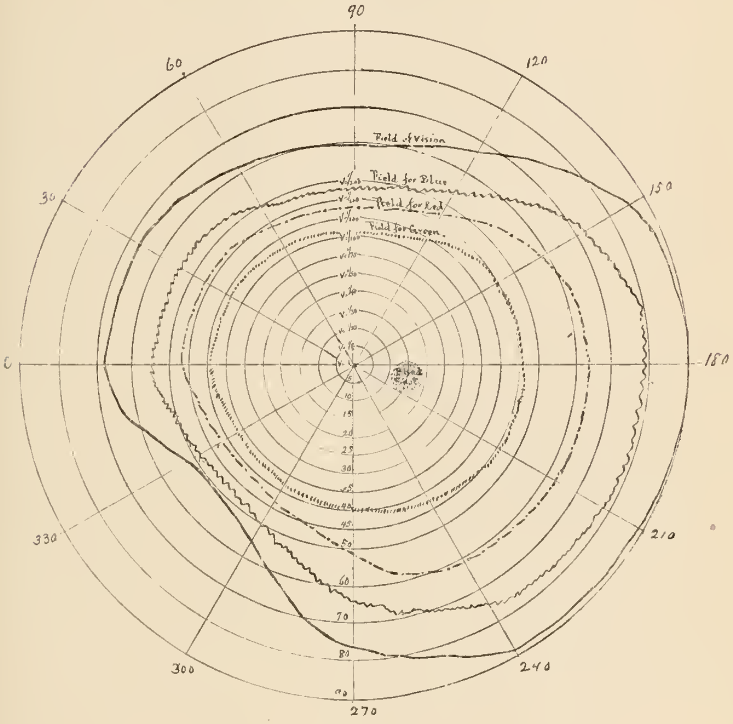

FIG. 18.

Map of normal Field of Vision for Right Eye. The limit of the Zone possessing $V=\frac{1}{cc}$ *is irregular; it extends to 50° on the temporal, and to 40° on the nasal side.*

The accompanying chart, which furnishes a *bird's-eye view* of the functions of the healthy retina, has been very useful in my hands for the past two years, and will, I think, prove equally so to other members of the profession. It is convenient for reference when a careful study of the field of vision is undertaken ; and not infrequently it serves as a stimulus to a more critical examination than would otherwise be accorded. It is too much the custom to note only the areas of absolute blindness in the field of vision, while simple diminution of central or peripheral vision, or its limitation in certain areas of the field are entirely overlooked ; and thus much important information is lost. The cut explains itself. It is simply a chart for recording perimetric measurements of the field of vision, upon which are outlined the normal limits of the field for objective perception, and for the perception of the three primary colors, and, besides this, the amount of vision possessed by the different zones of the retina, appears at intervals of every five degrees from the centre. The test objects for measuring eccentric vision may be easily made, by drawing on slips of white paper two or more black squares, representing in measurement, cross sections of the limbs of Snellen's test-letters, and numbering them according to the same notation. The radius of curvature of the perimeter should be one foot, the *unit* of measurement of vision in general use. *Accuracy* has been sacrificed to *symmetry*, in making it appear that the zone possessed of $V=\frac{1}{\text{CC}}$, is co-extensive in all of the different meridians. The real limit of this zone is irregular. It extends to 50° on the temporal and to 40° on the nasal side ; no attempt is made to show this on the chart, for it is thought that it will be easier to *bear this in mind* than to make it *appear in the cut*, which is *schematic* only.

THE AMERICAN OPHTHALMOLOGICAL SOCIETY.

[CONCLUDED FROM PAGE 263.]

AFTERNOON SESSION.

The first paper of the afternoon session was a report of 263 cases of cataract extraction with particular reference to the after-treatment, by George Strawbridge, M. D., of Philadelphia.

Two hundred and twenty-three of the above cases had never been reported. The operation was performed by the modified flap extraction in which the incision lies mid-way between the old Graefe incision and the corneal flap incision. It avoids the risks of both of these methods, and gives a sufficiently large opening. An iridectomy in an upward direction was always performed. Formerly the lens was removed by pressure with the spoon directly on the cornea, but fearing injury to this structure, pressure with the finger on the eye-lid has been substituted. The results had been as follows: successful cases, 85.2 per cent, partial successes, 8.1 per cent, and failures, 6.7 per cent. Those cases were classed as failures in which fingers could not be counted at a distance of one or two feet. In twelve cases absolute loss of the eye occurred. Eleven were lost by choroiditis, and one by choroidal hæmorrhage.

After the operation the eye was thoroughly cleansed, and for the past two years a solution of boracic acid (two per cent) had been employed. The speaker's former plan had been, after applying a bandage, to put the patients to bed in a darkened room, keeping them in bed for from four to six days. Two-thirds of the cases had been treated in this way, but he had found this plan exceedingly debilitating in elderly individuals, and during the past eighteen months he had gradually given up this plan, so that now the patients were, practically speaking, kept in bed only twenty-four hours in a room as light as any ordinary room. The first element in the treatment of old people is to make them comfortable. If at the end of twenty-four hours everything is doing well, the patient is allowed to move about the room. No unsatisfactory result had followed this plan.

The speaker had employed in some cases cocaine. In one case in which a four per cent solution was used, a violent purulent inflammation began within twenty-four hours, and resulted in total loss of the eye. Subsequently, he had employed cocaine without any unpleasant results. His plan is to use a two per cent solution, drop in one drop, wait a minute, and drop in a second drop, and use only two drops. As much anesthesia as is desirable is thus obtained. He had never employed any antiseptic except the two per cent solution of boracic acid, and while this does no harm, he thought that it did little good.

He attaches much importance to stimulation after the operation, and in elderly people, the use of whisky is begun a few hours after the operation.

CATARACT EXTRACTION WITHOUT IRIDECTOMY.

BY DR. H. KNAPP, OF NEW YORK.

Of the new operative measures which he had seen in Europe, there were two which he thought particularly worthy of trial; one was extraction without iridectomy, and the other, advancement of Tenon's capsule. Of the fourteen cataract extractions which he had made since his return, the last six had been without iridectomy. Three of these had made ideal recoveries, no reaction, clear central movable pupil, neither an anterior nor a posterior synechia. The other three had more or less posterior synechiæ, leaving the pupil ragged and somewhat obstructed; yet the adhesions were simple, not spreading a pseudo-membrane over the area of the pupil. Vision was fair, and could be rendered excellent by a simple needling, if remaining insufficient.

He followed Panas in the performance of the operation; large section along the upper margin of the cornea, free laceration of the capsule, expulsion of the cataract and its remnants, reduction of the iris with probe, if it did not occur spontaneously. Before the operation the eye is fully cocainized, the lids and conjunctival sac washed and sterilized. The instruments are treated in the same way. After the expulsion of the lens, a small quantity of an antiseptic is injected into the anterior chamber along the whole section, and eserine instilled into the conjunctival sac.

The speaker believed that the chief advantage of this operation lies in the possibility of keeping the wound perfectly free from foreign matters, including portions of the lens, capsule and iris. How often anterior and posterior synechiæ occurred, what the final visual results were, and how frequently after-operations would be required, were questions which could only be answered by extended statistics.

Report of Fifty Cases of Cataract Extraction.

BY DR. DAVID WEBSTER, OF NEW YORK.

In seventeen cases the operation was done under ether; in twenty-seven, under cocaine, and in six no anæsthetic was employed. The results were, successes, 41 cases, or 82 per cent; partial successes, 6 cases, or 12 per cent; failures, 3 cases, or 6 per cent. Aseptic precautions were used in all the operations. The best vision obtained in any case was $\frac{20}{XV}$. Dr. Webster advocated the extraction of both lenses at the same sitting in judiciously selected cases.

Dr. Webster also related the history of a case in which he had relieved the pain in a glaucoma absolutum by lacerating the infra-trochlear nerve (Badal's operation). (See July number this journal, page 174.)

Death of a Patient on the Third Day after the Extraction of a Hard Cataract.

BY DR. HENRY D. NOYES, OF NEW YORK.

On Sunday morning the operation, which was perfectly satisfactory, was performed, and the patient suddenly died the following Friday morning. After the operation a bandage was applied and the patient put to bed. The dressing was not disturbed until the third day. Everything seemed to be doing well and the patient made no complaint. On Friday morning she suddenly complained of a feeling of prostration and within half an hour she died. The only lesions found at the autopsy were dilatation of the heart and insufficiency of the valves of the left side. The death seems to have been due to heart failure. The contents of the orbit were removed *en masse.* A certain amount of force was used and, as a consequence, the corneal wound was partially ruptured. The eye ball was hardened, and ten sections have been made which demonstrate the kind of union which we have at the end of the fifth day. Inspection of the eye before death showed that the union was smooth and apparently perfect. What is particularly interesting is that the union appears to have taken place exclusively through the medium of the epithelial layer.

Discussion.

Dr. David Webster, New York, said that the oftener he employed cocaine the more did he see the necessity of using as little as possible in cataract extraction. Some of his cases that have done badly, he thought were due to the use of too much cocaine. In his later operations he had done about as Dr. Strawbridge has recommended.

Dr. B. Joy Jeffries, Boston, had found it of decided advantage in cataract extractions, to instil cocaine into both eyes. One drop a minute or two before the operation is sufficient. It renders the well eye quiet, and the patient can keep it open without difficulty.

Dr. C. R. Agnew thought that probably the best plan to follow in the use of the cocaine is to instil a drop of the four per cent solution and hold the lids open to allow it to become diffused. Then wait three or four minutes, and then touch the eye with an instrument to ascertain whether or not the sensitiveness has been sufficiently obtunded. One or two drops are usually sufficient, and employed in this way the possibilities of evil effects are reduced to a minimum.

It has never been our custom in New York to incarcerate patients in the dark after a capital operation on the eyes.

Dr. W. F. Mittendorf, of New York, had seen two cases of serious complication after cataract, which he attributes to the use of cocaine. In one the eye was lost, and in the other it came near being lost. The cocaine solutions were fresh. but they were strong, and used free. He thought that one reason bad results are obtained is because the eye is left exposed to the air for several minutes after the introduction of the cocaine solution. Recent observations show that the injurious action of cocaine is especially upon the epithelial layer, and in shutting off the supply of lymph fluid. The epithelium suffers very rapidly from lack of moisture, especially if the eye is kept open. It has been recommended to close the eye immediately after the introduction of cocaine. He uses a weaker solution than a two per cent, making it fresh every day, by the addition of one or two grains of cocaine to half an ounce of water. Since he had used the weak solution, and had closed the eye after its instillation, he had had no serious accident.

Dr. William Thompson, of Philadelphia, said, in regard to the efficiency of weak solutions of cocaine, that the first time he used this drug, he directed the apothecary to make a two per cent solution. Instead, he made a solution of two grains to the ounce. Three operations were performed with perfect success, and the mistake was not discovered until afterwards. Since then he had not considered it necessary to use strong solutions.

Dr. Emil Gruening, of New York, said that last summer he went to DeWecker's clinic to see him perform cataract extraction without iridectomy. He learned that he employed this method only in the winter time, the reason for this being that during the hot weather of summer, the patients were very restless, and that, as a result, prolapse of the iris frequently occurred. He decided to try the operation when he returned, and in May, 1886, performed his first operation. Half an hour before the operation he instilled a few drops of a solution of eserine (gr. ss to ℥j), and a few minutes before the operation the eye was cocainized with a four per cent solution. There was no difficulty in removing the lens. After the operation eserine was again instilled and the eye bandaged. Forty-eight hours later the bandage was removed. The patient made pressure on the eyeball, the anterior chamber was emptied and the iris prolapsed. He was compelled to remove the iris. There were no further accidents. A few days later he operated on a second case, with perfect success.

In regard to the action of cocaine he referred to a case of an acute exacerbation in chronic glaucoma. The eye was very painful and hard. Intending to perform sclerotomy, a six per cent solution of cocaine was instilled. A few minutes later, on opening the lids and introducing the speculum, a bladder arose between its blades. Examination showed that this was the epithelium of the cornea which had raised. The operation was postponed, but it eventually became necessary to remove the eyeball.

Dr. H. D. Noyes, New York, stated that he had performed extraction without iridectomy in six cases. He had used cocaine, and the cleansing of the anterior chamber and the removal of lens matter had been accomplished partly by manipulation and partly by irrigation. For washing out the conjunctival sac and removing matter from the anterior chamber he used a rubber bulb, holding two or three ounces, and terminating in a short nozzle. It is not necessary to introduce a nozzle between the lips of the wound. The iris may be satisfactorily replaced by a stream of water. He had also used eserine, not as a preliminary, but as a dressing, using an ointment containing two grains of eserine to the drachm of vaseline. In three of the six cases there was perfect union with a central circular pupil and accurate vision. In one case, intra-ocular hæmorrhage came on twelve hours after operation, but this might happen under any method. In two cases prolapse of the iris was found on the seventh day. The prolapsed iris was excised, and in one case the result was entirely satisfactory. In the second case no satisfactory vision was obtained.

The impression on his mind from this small series of cases was that while the operation deserves attention, the cases must be carefully selected. If the patient had but the one eye, he thought that he should prefer to operate on it with a preceding iridectomy. He believed a satisfactory result can be more certainly secured with iridectomy. As to the visual result, while theoretically it should be better, it is not always so.

Dr. Samuel Theobald, of Baltimore, stated that in a case where there was stricture of the nasal ducts, he invariably observed that after the instillation of cocaine, the cornea which had been clear and bright, became dull, presenting the appearance as though it had been roughly handled. He had noticed similar effects in other cases.

Dr. B. E. Fryer, Kansas City, had employed cocaine in this way, by inserting one drop every half hour until four or five drops have been used. In this way, the iris becomes completely anæsthetized, and when we wish to perform iridectomy this is important.

Dr. B. Alexander Randall, of Philadelphia, remarked that there is one point not distinctly referred to in the discussion, and that is whether or not inflammation of the iris is more frequent after this operation than where iridectomy is done. In the thirty or more cases which he saw at the clinic of Panas two years ago, there was not a single case of iritis. There were, however, several cases of prolapse. Panas claimed that there was less inflammation than after the ordinary operation. He thought that with a small iridectomy the pupil may be as movable and as central as in the operation referred to.

SOME MEDICO-LEGAL CASES.

BY B. JOY JEFFRIES, M.D., BOSTON.

The author first read the law of Massachusetts in regard to the examination of R. R. employees and others for color-blindness, and stated that it was practically a dead letter and could not be enforced. In order to make it efficient, some standard must be adopted. Many instances in which the law had been evaded were given.

Dr. Charles A. Oliver, of Philadelphia, exhibited and read a description of a new series of loose wools for the scientific detection of sub-normal color perception (color-blindness).

They comprise ninety-seven bundles of Berlin worsteds composed of five (5) large principal test-skeins, twenty (20) small pure match skeins and seventy-two small confusion skeins. To each small skein there is attached a metallic bangle bearing the exact equivalence of the color's combination, tint and shade stamped upon it in a way that can be only understood by the surgeon. The colors are all of equal relative intensity. The wools are all of one manufacture, and have been dyed with vegetable materials.

The following advantages are claimed for the series. That there are five tests, that the wools are loose and all of the colors of the same relative intensity, that each skein has its value expressed so that they can be employed by any intelligent layman; that accurate notings of color changes can be made for future comparison and proper verbal and written expression can be given, that by reason of the wools all being made of the same grade of manufacture and all the colorings obtained from vegetable dyes, no results can be gotten from the supplemental use of touch, and finally that a black surface is employed, and no definite order of testing need be pursued.

Dr. William S. Dennett, of New York, exhibited a set of Holmgren's worsteds which had been made into spheres, to each of which a number was attached. It was thought that considerable elegance and some advantage would result from using Holmgren's and Thompson's tests in this form.

Adjourned to meet in the evening at 8 o'clock.

First Day. Evening Session.

Dr. Samuel B. St. John presented a communication from Dr. Bolton, of Trinity College, to the effect that he had discovered that his grandfather, Dr. North, had founded in New London, Conn., in the spring of 1817, the first Eye Infirmary established in the United States. The communication was referred to the committee on publication. The first paper read was on the

Effect of the Electric Light Upon the Eye.

BY DR. J. A. ANDREWS, OF NEW YORK.

The injurious effect of various forms of light upon the eye were first considered, and numerous instances cited showing the harmful effect of exposure of the eyes to bright sunlight, bright lamp light and to the reflection of the sunlight from snow. Cases were given in which a short exposure to the sunlight was followed by swelling of the lids and of the conjunctiva. These symptoms yielded to sedative applications. The effects of lightning are probably due to the physico-chemical action of the electric current causing coagulation of the albumen in the crystalline lens. The opacity of the lens occurring among glass-blowers seems to be chiefly due to the intense heat to which the eyes are exposed. The speaker had found lenticular cataract in four per cent. of glass-blowers under forty years of age, and twenty per cent in those over forty years of age whom he had examined.

In considering the relative effect of different forms of illumination that obtained from gas, from kerosene and from the incandescent electric lights were studied. The electric light gives the maximum of light with the minimum of heat. So far, the only cases of injury to the eye from the electric light have resulted from exposure in close proximity to the intense light of the arc-light. In most of these cases the existence of previous eye-trouble was not excluded. The effect in these cases can be best explained as occurring through the sympathetic nervous system rather than as a result of mechanical or chemical influences. It is not established that exposure to bright light can produce a diffused iritis. No case of injury to the eye from the incandescent light has been reported, and out of eleven hundred workers with the electric incandescent light examined by the speaker, there was not one complaint. The light used was from twelve to sixteen candles and provided with a shade to protect the eyes. The incandescent light possesses advantages which are wanting in other forms of artificial light, the principal of which are its steadiness and the fact that its use does not contaminate the atmosphere.

DISCUSSION.

Dr. C. R. Agnew, of New York, said that the incandescent electric light had been introduced with advantage into Columbia College reading room. All who have made use of it have expressed great satisfaction with it.

Dr. W. F. Mittendorf, of New York, said that the popular feeling has been against the electric light as injurious, but his experience proved the contrary. The light is so perfect that it need not be approached so close to the eye, and the efforts of accommodation are less. On account of its steadiness, less work is thrown upon the iris than with a flickering light.

A METHOD OF OVERCOMING DIPLOPIA WHEN PRISMS ARE NOT FULLY EFFECTIVE.

BY WILLIAM S. LITTLE, M. D., PHILADELPHIA.

Double vision, especially in the lower field, is a source of danger in walking. This is the case even where prisms are worn, as the patient by not holding the head forward may look under the spectacle and thus see double. A case of an elderly person with modified paresis of the superior oblique was described. This had led to two severe falls. A prism of six degrees properly placed united the double images below the horizontal line. Above this plane objects are single. Myopia also existed in each eye and required the combination of a sphero-cylinder with a prism for the right eye to correct the myopia and diplopia. In order to prevent looking under the glass and seeing double in the lower field, the speaker had resorted to the following procedure. The sphero-cylinder correcting the myopia of the right eye has been ground opaque for one sixteenth of an inch above the horizontal plane, so as to obliterate sight in the lower field of vision in this eye. Then there has been attached to the lower portion of the frame the wire net-work used in protection glasses. This is carefully adjusted to fit close to the face, the perforations in the gauze having been stopped by painting. Vision is thus cut off below, and under the spectacles. In this way, vision for the affected eye is only through the upper part of the myopic correction, and the necessity for a prism is done away with. The other eye has its myopic correction and is the one in which vision in all parts of the field is clear. The right eye is only used in the upper part of the field where no diplopia exists. This is better than entirely closing the affected eye by a ground glass, and is found more effective than with the prism, as danger of falling by seeing double is prevented. The same method may be applied to a diplopia in any position in the visual field.

The spectacles were exhibited.

TWO EPIDEMICS OF MOLLOSCUM CONTAGIOSUM.

BY DR. W. F. MITTENDORF, OF NEW YORK.

The contagiousness of this affection has been a matter of much dispute. The two epidemics which had come under notice had occurred in asylums for children. In the spring of 1885 a little child having one or two small warts on the eyelid was admitted to one of these institutions. In a few weeks other children exhibited similar growths on the eye-lids, in some cases spreading to the lips and to the nose. Within three months after the admission of the first case, twenty-seven children were more or less disfigured by this affection.

In the second institution as many as forty children were affected at one time. Twenty children were sent to board with a farmer. One of these had molluscum. In a short time the affection spread to over half of the children. It also attacked the child of the farmer and his wife. In a number of cases the tumors involved other portions of the face, but they were most marked on the lids.

As soon as attention was called to the condition, energetic treatment did away with it. Excision with scissors and touching the base with nitrate of silver proved most satisfactory. Simple pressing out of the matter is more painful than excision. Unless excision is employed, the disease is apt to return.

MELANO-SARCOMA OF THE CONJUNCTIVA AND CORNEA.

BY DR. W. F. MITTENDORF, OF NEW YORK.

The patient, a married woman aged 46, came under observation August 22, 1884. In April of that year, a black spot appeared upon the lower part of the conjunctiva and was removed. When she came under observation, two other tumors had appeared. They were about the size and shape of cucumber seeds. Two or three spots looking as though ink had been dropped on the eyeball were also noted. The tumors were movable and the conjunctiva surrounding them slightly congested. Otherwise the eyeball was normal and vision almost perfect. The growths did not affect the left eye which was highly astigmatic. The patient was a strong hearty woman with no appearance of cachexia. There has been no injury to the eye and the family history was good. The pre-aural glands and those of the neck were not enlarged. The tumors were removed and the wound in the conjunctiva brought together with sutures. Healing took place rapidly.

Four months later, she returned with two growths starting from the lower portion and the outer canthus of the same eye. There was also a small flat growth on the cornea not connected with the tumors. The tumors were again removed and the patient returned to her home.

In the spring of 1886 she again made her appearance with the eye closed. There was a small tumor the size of a cherry which had developed at the seat of the former growths. The tumor with a portion of the conjunctiva was removed. A preaural gland and some glands in the neck were found slightly enlarged. The general health remained good. She had in fact gained in weight since the previous operation.

Four or five weeks ago she again returned with another growth. The eyelids could not be separated. An incision was made and the tumor removed.

Microscopical examination showed the growth to be a sarcoma with round cells. The melanotic appearance was chiefly due to hæmorrhage in the parenchyma. Pigment granules were also present.

DISCUSSION.

Dr. H. D. Noyes, of New York, referring to a case of melanotic sarcoma on which he operated some years ago, said that the disease had not returned.

Dr. H. Knapp, of New York, had seen a number of these cases on which he had operated as carefully as possible, but they have all after a variable period, relapsed.

Dr. B. E. Fryer, of Kansas City, presented a paper on

THE USE OF HOT WATER IN SOME OF THE CORNEAL AND CONJUNCTIVAL INFLAMMATIONS.

In this plan of treatment the water is used at as high a temperature as can be borne. After a few hours, a temperature of 140° can be tolerated. The water should not be of a lower temperature than this, and as much higher as the patient can stand it. A method of using it is by fomentation with a napkin dipped into the hot water and not wrung out, and applied to the closed eyelids. This is continued for half an hour at a time and repeated one, two or three hours day and night. It may also be applied by suspending a vessel above the patient and allowing the water to escape through a tube, thus keeping up a continuous action of the hot water. In some cases the temperature may be raised almost to the boiling point. During the intervals between the applications, a cloth wrung out of the hot water is allowed to remain over the eyes. In some cases of purulent opththalmia, the hot water may be thrown into the conjunctival sac.

In purulent conjunctivitis this application cuts short the attack more quickly and safely than the use of ice cold water. In gonorrhœal ophthalmia, it quickly lessens the swelling and diminishes the occurrence of ulceration of the cornea. If ulceration has commenced, it is less likely to progress, and the amount of cicatricial tissue is lessened. In these cases, he occasionally uses instillations of sublimate solution or finely powdered iodoform. This plan of treatment is not so readily applied in ophthalmia neonatorum. In catarrhal conjunctivitis and phlyctenular ophthalmia, it is a good adjuvant. In acute and chronic keratitis it is useful. Its most marked effects are seen in corneal ulcer. The small amount of opaque tissue left is astonishing. The pain and photophobia are also diminished by the hot water.

In the discussion which followed, Dr. William F. Norris, of Philadelphia, said that he had had good results from the use of hot water (120°–125°) in gonorrhœal ophthalmia. It is a comfortable application, and several apparently unfavorable cases have gotten well under its use.

Dr. Samuel Theobald, of Baltimore, had not employed hot water in purulent affections of the eyes, but in interstitial keratitis and specific keratitis its use has been beneficial. He thought that it favors absorption of the opacity of the cornea. Constitutional treatment and the use of atropia of course accompanied the applications of hot water.

ASTHENOPIA AND THE CHANGES IN REFRACTION IN ADOLESCENT AND ADULT EYES.

BY WILLIAM F. NORRIS, M. D., OF PHILADELPHIA.

The speaker first referred to the changes occurring in the shape of the eyeball at various periods of life. It is regarded by some as not necessary to correct slight errors of refraction, but the author considered their correction as of great importance when they produce asthenopia. By removing the trouble, the congestion and softening of the eye is removed, and the lengthening of its visual axis is prevented. This congestion and softening were regarded as important factors in the production of astigmatism and conical cornea.

A number of cases of diminishing hypermetropia and of hypermetropia passing into myopia were described. Diminishing hypermetropia and increasing myopia are simply different stages in a process essentially the same. They are both the result of softening of the eyeball and slow distension in the direction of the visual axis. Careful correction in these cases is one of the best means of preventing their further progress. The eyes should be carefully measured under the influence of a mydriatic. The enforced rest of the eye thus obtained, is an important aid in diminishing the congestion. During the dilatation of the pupil, dark glasses should be used even in a mild light. All cases of hypermetropia where there is a decided difference in level between the disk and the macula, should be carefully watched.

DISCUSSION.

Dr. E. Gruening, of New York, had been much interested in one group of cases. In this, the patient on arising, has pain in the eyes with photophobia passing off in an hour or two. He is not able to fix on any object for any length of time. There is also lachrymation. With such symptoms he usually finds evidence of nasal disease. All the affections due to nasal irritation are increased by the recumbent position, for this favors congestion of the erectile tissue of the nose. It is not probable that eyes which have rested all night would manifest painful sensations, and this fact tends to exclude ordinary asthenopia in these cases. He has treated these patients by removing the nasal trouble, and in a series of 200 cases 150 had been benefited, while the remaining fifty had passed from observation.

The meeting then adjourned.

THURSDAY, JULY 23, SECOND DAY, MORNING SESSION.

The first paper read was entitled:

THE AMBLYOPIA OF SQUINTING EYES: IS IT A DETERMINING CAUSE OR A CONSEQUENCE OF THE SQUINT?

BY S. THEOBALD, M. D., BALTIMORE.

He criticized the views of Alfred Graefe and Schweigger that the amblyopia exhibited by squinting eyes is a congenital defect and argued in favor of the older view that the amblyopia is secondary to the squint and due to mental suppression of the visual image formed in the squinting eye. He stated in the first place that it is a mistake to call this variety of amblyopia "amblyopia ex anopsia," as the amblyopia is not due simple to want of use of the squinting eye, but to an active cerebral process which induces a much more rapid loss of vision. Schweigger and Alfred Graefe, who both accept the theory of acquired retinal identity, believe that squint is often due to a non-establishment after birth of retinal identity. If this were the case, as there would be from the first no stimulus to binocular fixation, the squint ought to develop in early infancy, whereas it is rarely met with then, but usually makes its appearance about the fourth or fifth year. They both also lay stress upon the fact that some squinting eyes retain good vision for years, while others which have squinted but a short time are highly amblyopic and that this contradicts the theory that the amblyopia is produced by the squint. These observations, however, do not conflict with the suppression theory, for as the amblyopia doubtless develops during the forming stage of the squint, it is reasonable to suppose that in some cases it will have reached a high grade by the time the squint is fully established, while on the other hand, a marked difference in the refraction of the two eyes (because then the diplopia will be less annoying) will explain the retention of vision in the squinting eye.

The most convincing argument, however, in favor of the suppression theory is that the peculiar regional characteristics, which the amblyopia exhibits are of just such a nature as we should anticipate if this hypothethis be the correct one, but entirely inexplicable if we suppose the amblyopia to be a congenital defect.

Until more convincing evidence is adduced to sustain the congenital amblyopia theory, it was suggested that we ought to act upon the older theory, that the squint produced the loss of vision, and so give our patients the benefit of an early operation for the correction of this deformity.

Discussion.

Dr. H. D. Noyes did not agree with the conclusions presented in the paper. His objections were based upon an experience and careful observation for a number of years. It has been claimed that before the development of the squint such patients have had binocular vision. There is no proof of this, and the evidence is against it. He had the records of a large number of cases of monocular amblyopia, presumably of congenital origin, without lesion demonstrable by the ophthalmoscope, which had had no squint, although they may or may not have hypermetropia. Binocular fixation after operation is not infrequent, but according to his experience, binocular vision is obtained in only one-fifth of the cases. It is rare to find material improvement in an amblyopic eye after operation.

Dr. O. F. Wadsworth, of Boston, agreed with what Dr. Noyes had said. After a careful examination of this subject ten years ago, he had convinced himself that the amblyopia of squinting eyes was not due to disuse. At that time he thought that he was alone in that view, but on looking up the literature of the subject, he found that Schweigger had said the same some years before. I think that after operation there is no decided improvement in vision. It is sometimes said that there is, but this is largely due to the fact that the vision was not carefully measured before the operation.

Dr. George C. Harlan, of Philadelphia, said that in his experience, vision is not materially improved by operation. He had at times attempted to compel the patient to use the affected eye by keeping the fixing eye under the influence of atropia for a long time. In some cases he had succeeded in improving the vision in the amblyopic eye. He recalled one case in which the vision was increased from $\frac{20}{CC}$ to $\frac{20}{L}$. Some two years later this was still retained, the axis having become straight under the use of correcting glasses.

Dr. W. F. Mittendorf, of New York, said that in those cases in which there is a central scotoma we can not expect any improvement from an operation, but there are certain cases in which vision is at once improved. This he explained by the removal of the undue pressure exerted by the internal and external recti muscles, which is different from that exerted by the superior and inferior recti. The removal of this pressure puts the eye in a more favorable condition and we should expect better vision.

Dr. Samuel Theobald, of Baltimore, regretted that Dr. Noyes was absent when the early part of his paper was read, for he had taken up the objections which he had brought forward.

In regard to the restoration of binocular vision his test has been as follows: If we cover the eye which formerly squinted, we find that there is still a balance of power in the internal rectus. If the amblyopia is not of too great a degree, the patient is directed to fix his eyes on a certain object. The squinting eye is then covered, and it at once turns in. When the covering in removed, it again turns out, showing that it did so to obtain an image upon a corresponding point of the retina. To his mind that is conclusive evidence of the restoration of binocular vision. He agreed that where there is a considerable amount of amblyopia, there is no appreciable improvement after operation, but this has no bearing upon the question whether the amblyopia is congenital, or due to suppression.

Two Cases of Severe Traumatism of the Eye with Partial Dislocation of the Crystalline Lens.

BY DR. B. ALEXANDER RANDALL, OF PHILADELPHIA.

In the first case, a man of fifty, there were three points of rupture of the sclera visible on the upper surface of the globe, with some tendency to hernia of the contents. The upper half of the lens was in the anterior chamber in front of the iris, the lower half apparently being in nearly the normal position. It extraction was advised, but delay being asked, the operation was deferred. The lens receded under rest in bed and other appropriate measures. The scleral rupture healed, and in spite of disseminated opacities in the lens and in the vitreous, which prevented at any time a view of the eye-ground, the vision increased to about one-thirtieth of the normal. The patient has since been at work and fairly comfortable, the other eye giving no suggestion of sympathetic trouble. The injured eye shows little tendency to grow worse, although the lens is still luxated backwards.

In the second patient, a boy of twelve, the lens was less markedly luxated, but the ophthalmoscope showed two rents in the choroid,—the larger, a little outside of the macular region, the other close to the temporal margin of the optic disk. In connection with the latter there was a reddish area of choroid, embracing the upper and inner border of the disk, where the force had apparently been insufficient to rupture the membrane, but had given it a twist causing its inflammation and subsequent atrophy. The case progressed to an excellent recovery. The vision which had been lost improved to $\frac{6}{\text{XII}}$ +m, and the accommodation to the extent of some five dioptries. The choroid rents healed with little but pigmentation to mark their sites. The eye which had shown a high degree of myopic astigmatism, probably by reason of the dislocation and rotation of the lens, returned to the approximately emmetropic condition of the other eye.

The early and late appearance of the eye ground were illustrated by colored sketches.

The next paper, by Dr. Prout, was on "Badal's Operation — Laceration of the Inner-Trochlear Nerve for the Relief of Glaucoma, etc., with Cases."—[See this JOURNAL July, page 165, etc.]

DISCUSSION.

Dr. C. S. Bull, of New York, stated that where he had performed the operation for the relief of pain in glaucoma or ciliary neuralgia, while the relief was marked immediately after the operation, it was temporary only, and in every case returned.

H. Knapp, M. D., New York, read a paper on

ADVANCEMENT OF TENON'S CAPSULE IN STRABISMUS.

This operation was devised by deWecker, five years ago, who performed it in the following manner: A piece of the conjunctiva five millimetres long and ten millimetres high is detached from the region of the insertion of the tendon as a centre, leaving a small band near the cornea. Tenon's capsule is now incised near the insertion of the tendon and loosened along side of and under the muscle. The capsule is then stitched forward by two sutures, entering through the conjunctiva to the capsule at the lower and upper edges of the muscle, and coming out in the conjunctiva above and below the cornea. The greater the piece of capsule loosened and stitched forward, the greater the effect. If the effect appear too great, the stitches are removed the next day. If not they are allowed to remain four or five days. De Wecker used capsular advancement for cases of insufficiency, to strengthen the weak muscle, for high degrees of strabismus both convergent and divergent.

Dr. Knapp, during the present summer had done the operation ten times. His operation differed from that above described in leaving a broader conjunctival flap, and in using a third middle suture. His intention was to advance the whole anterior portion of the vertically folded muscle and the capsule, and produce plastic inflammation which through subsequent cicatrization, would shorten the parts. The operation was performed in two cases of convergent strabismus due to paralysis of the external rectus. In these cases the operation caused decided improvement. The eyes could be approached to within two millimetres of the outer commissure. The formerly paralyzed external muscle had gained a considerable degree of power. The operation was performed on two cases in which former tenotomies had not overcome the difficulty. The operation was followed by improvement in both cases. In six cases the operation was performed for convergent strabismus of high degree with considerable amblyopia. The results have all been good.

In none of the cases has there been any alarming reaction, although there was for some weeks redness and swelling in the region of the advanced capsule. At first Dr. K. had used catgut sutures, but one gave way on one occasion and since then he has employed black silk sutures. Antiseptic precautions have been employed in all cases. The speaker preferred advancement of Tenon's capsule to simple advancement of the tendon, because the operation is simpler and attended with less risk. The preservation of the natural attachment exposes the muscle less to inflammation and there can be no undue retraction in case of failure. His experience with limited advancement of Tenon's capsule has been quite encouraging.

Discussion.

Dr. George C. Harlan, of Philadelphia, asked if Dr. Knapp, considered this a safe operation? Four or five years ago, he had performed the operation a number of times and was much pleased with it until he had a case of panophthalmitis.

Dr. H. Knapp, in reply, said that a year ago he considered it a dangerous operation, but his views have changed considerably since then. Under antiseptic precautions, the danger is much lessened. Where suppuration occurs within the first twenty-four hours, it is certainly the result of infection, and not due to the traumatism alone.

A Case of Tumor of the Left Occipital Lobe.

BY DR. EMIL GRUENING, OF NEW YORK.

The chief interest of the case lay in the fact that the disease of the brain was localized by the existence of homonymous hemianopsia. Diagrams showing the course of the optic fibres were shown. At the autopsy a hard mass was found in the left occipital lobe, and the whole cortex of this lobe was destroyed.

New Formation in the Vitreous of Both Eyes.

BY DR. J. S. PROUT, OF BROOKLYN.

The patient was a young man, aged 16. He had never had any trouble with the eyes. In the right eye there is a body arching forward. There is no evidence of any relation to the papilla. The speaker thought that it was, in all probability, a remnant of the fœtal circulation of the vitreous. In the left eye there was a similar body. Drawings showing the appearance presented were exhibited.

Dr. Edward Jackson, of Philadelphia, presented a Lens Series for the Refraction Ophthalmoscope.

Dr. John Green, of St. Louis, exhibited and described a new series of Test Letters.

Dr. Charles A. Oliver, of Philadelphia, presented a Set of Metric Test Letters and Words for determining the amount and range of accommodation. They are made of six sizes of differently arranged words, each word containing three or four of the seven letters, O D E T O L F. Each letter is made in exact conformation with the Snellen basis. The adoption of such a series puts the determination of the acuteness of vision and of accommodation upon an uniform basis.

A CASE OF RETINITIS ALBUMINURICA—INDUCED PREMATURE LABOR.

BY DR. S. D. RISLEY, OF PHILADELPHIA.

The patient, the wife of a physician, was seen September 24, 1884. She was between the fourth and fifth month of pregnancy. She had suffered with headache and giddiness. The urine had been examined a week previously and no albumen was found. At this time there was marked disturbance of vision. In a previous pregnancy she had had albuminuria, but no trouble with sight. In a second pregnancy there had been no trouble.

The ophthalmoscope showed albuminuric retinitis of both eyes. The urine contained a large quantity of albumen. After standing two days, the albumen constituted four-fifths of the entire contents of the test tube. After consultation with her husband and Dr. William Goodell, the induction of abortion was advised, but to this the patient positively refused to consent. Finally, after consultation with her clergyman, she consented.

Labor was induced, and she was delivered of a fœtus at five months. She then passed into an unconscious condition in which she remained four days. There were no convulsions. As consciousness gradually returned, evidences of right-sided hemiplegia with aphasia were noted. The quantity of albumen gradually diminished. Six months later the lady was able to return to the office. There were still some traces of aphasia. Vision was greatly improved.

The object in reporting the case was to put on record an additional experience in the management of a condition presenting so many serious considerations.

Dr. B. Alexander Randall exhibited a modification of the Loring ophthalmoscope, which consisted in adding a series of cylinders from .25 D to 4 D.

THE FREQUENT INSTILLATION OF A TWO PER CENT SOLUTION OF NITRATE OF SILVER IN PURULENT OPHTHALMIA.

BY J. A. ANDREWS, OF NEW YORK.

He had employed this method in twenty-five cases of gonorrhœal ophthalmia, and the eyes were seriously damaged in none of them. The cases were all severe, with much discharge, chemosis and swelling of the lids. The applications were repeated usually three times a day; sometimes as often as five times per day. The use of the nitrate of silver is graduated to the amount of hyperæmia, and especially to the amount of swelling of the lids. If this is marked, he did not fear to repeat the instillations frequently.

Dr. Russell Murdoch, of Baltimore, exhibited an impervious covering for the sponge in the administration of ether.

MEASUREMENT OF ASTIGMATISM BY THE OPHTHALOMETER OF JAVAL AND SCHIOTZ.

BY DR. H. D. NOYES, OF NEW YORK.

The instrument is useful for purposes of rapid determination, for confirmation, and, in doubtful cases, for diagnosis.

Dr. H. D. Noyes also read the following papers (by title):

Burns of the Eye by Fulminate of Silver and Fulminate of Mercury.

Case of Foreign Body in the Globe, including Two Cases of Spontaneous Extrusion.

The officers for the ensuing year are as follows:

President, Dr. William F. Norris, of Philadelphia;

Vice-President, Dr. Hasket Derby, of Boston;

Secretary and Treasurer, Dr. O. F. Wadsworth, of Boston;

Corresponding Secretary, Dr. J. S. Prout, of Brooklyn.

The next meeting will be held at the Pequot House, New London, Conn., on the third Wednesday of July, 1887.

CORRESPONDENCE.

ADOLF ALT, M. D.,

DEAR DOCTOR: — I have been too ill to look carefully at my article in the August number of your valuable journal.

Please publish the following, if you feel it is necessary.

At page 221, the last paragraph, the solution of the action of the glasses is not correctly stated. It reads that on placing in the holder of the prisoptometer, a +D7. spheric, in the case given of hyperopia = +D1.0, there will be induced D7. of artificial myopia. This is incorrect, for in this case, not D7., but D6. of artificial myopia will result, the remainder of +D7., viz., +D1. positively correcting the D1. of hyperopia. Hence when the —D6. spheric is applied behind the +7D., it corrects the 6D. of artificial myopia, and the +D1. of the +7D. corrects the hyperopia, and now the images are tangent and upon the retina. Rule I. (see page 222) is hence practically correct.

Again, on page 222, 4th paragraph from the top, while the conclusion is correct, the solution is not true. In the example given there is not D7.5. of artificial myopia induced by adding the +D7. spheric in the instrument, but only D6. of artificial myopia. In the case given D0.5 of manifest or spasmodic myopia. If this be corrected with —D0.5 spheric, then the images of the instrument will be tangent upon the retina. Leaving this glass in, and adding +D7. there will be induced 6D. of artificial myopia and D1. of the +D7. will positively correct the D1. of hypermetropia, which has been shown to be present by duboisine. Finally adding —D6. spheric over the two glasses already employed, the D6. of artificial myopia will be corrected and the circles tangent. But suppose we do not correct the spasmodic myopia preliminarily =—D0.5, and apply at once the +7.D. and then the —6. 5 D. the result will be the same. The last D6.5 glass will correct —6D. of artificial myopia, and also the —D0.5. of spasmodic myopia, and leave now +7D— (—6.5) =+D0.5 hyperopia corrected. But in this case and similar ones, this spasmodic myopia (—0.5D.) is but a concealment of hyperemetropia equal in degree to the negative ametropia from spasm, or, in this example, —D0.5, This quantity, therefore, should be considered as positive and added to the +D0.5 H. already found, or +D0.5+ (+0.5) =+D1.0 hyperopia.

Rule II. (page 222) although practically correct can be rendered better thus:

Rule II. From +D7. deduct the negative spheric which causes the "object circles" to touch, and to the remainder add the manifest or spasmodic myopia as a + quantity. Thus, +D7.— (—6.5) =+D0.5.+ (+0.5 spasmodic myopia) =+-D1.0H.

So too, Page 222, last paragraph, under "case third," of manifest and latent H., the true solution is as follows: Manifest H=+D0.5. + latent H=+D0.5= total H=+D1.0. Apply now +D7. and there will be induced +D7.— (+D1.) =D6. of artificial myopia, the +D1. of the +D7. correcting the total H. Adding now the —D6. the circles are seen together, and the artificial myopia =—6D. is corrected.

Rule III. does not need to be changed.

Very respectfully, H. Culbertson.

Zanesville, O.

EDITORIAL NOTICE.

In the article of Dr. Fox and Mr. Gould in our September issue, page 251, a disagreeable error has occurred. Please notice that the four lines dropped in between the annotations should appear after the fourteenth line from above and before what is now the fifteenth line.

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THE RATIONAL TREATMENT OF PATIENTS AFTER CATARACT OPERATIONS*.

BY F. C. HOTZ, M. D., CHICAGO.

With the great advancement in ophthalmic surgery, and particularly in the operations for cataract, achieved in the last twenty-five years, it is singular that the spirit of progress so characteristic of our age, has paid so little attention to the treatment of the patients after the operation. If we look around in the ophthalmic hospitals we see the patients treated to-day just as they were treated thirty years ago. We may find a few exceptions, but they are few and far between; and, as far as the text-books represent the position of modern ophthalmology, they too teach the same old-fashioned treatment of cataract patients with roller bandages, dark room and recumbent posture in bed.

It cannot be denied that this treatment is anything but agreeable to the patient, and many patients dread it worse than the operation itself. But, if all this be absolutely necessary for the safety of the eye, it must, of course, not be neglected; for the safety of the eye is of greater importance than the comfort or pleasure of the patient. If, however, we could convince ourvince ourselves that the healing process is not disturbed or retarded or the success of the operation jeopardized by omitting one or the other of these measures, it would become our duty to modify our treatment accordingly, for we have certainly no right to subject our patients to any greater discomfort than the safety of their eyes imperatively demands.

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*Read before the Chicago Society of Ophthalmology and Otology.

In the beginning of my practice I followed, of course, the example of my preceptors, and adopted the treatment as I had seen it in the large eye clinics in Europe. The operation was performed in the patient's room; the eyes were carefully bandaged, he was then carried to bed, undressed, and told to remain quietly on his back; and all light was excluded from the room. When the bandage had to be changed, or I wished to examine the eye during the first three or four days, it was done by a dim candle light. But very soon I questioned the necessity of this darkness; and later on I began to doubt the rationalism of enforced rest and the utility of the prolonged recumbent posture of the patient. I had patients—whom at that time I thought very irrational—who insisted upon sitting up in bed, or even got up to sit in a chair directly after the operation; and to my surprise they recovered just as fast as those who lay in bed on their back as quietly as a log. In the Infirmary the operations were performed in the operating room, and the patients afterwards walked across the hall to their bed rooms; and I could not see that this walk interfered in any case with the healing process. And thus one restriction after another was abandoned: so that for many years daylight has no longer been excluded from the rooms; and during the last two years the patients were allowed to sit up directly after the operation in a rocking, or easy chair, with a high back to rest the head on; they went to bed when they pleased and got up in the morning whenever they liked, and I have observed the patients felt more contented, were more cheerful, and more patiently endured the inconvenience of being blindfolded for several days. I even allowed these patients to walk up and down the room for exercise—of course with a guide—

which has the advantage of obviating the intestinal disorders and the debilitating effect so often induced in old people by too much confinement.

Now, has this treatment any disadvantages? I have discovered none. I have not found the healing to be slower or disturbed by any complications or accidents which could be directly or indirectly attributed to this mode of treatment. The recovery is as quick and the results are as good as under the old regime.

And why should they not? The dark room and the absolute rest of the patient are not among those conditions which modern surgery regards as essential for the prompt healing of a wound of the eyeball. When a wound has been carefully cleansed and thoroughly disinfected; when its edges have been well approximated, it will heal by first union provided the co-aptation of the edges be not disturbed. Therefore, the wound must be guarded by a protective bandage against insults of any kind, and against the disturbing effect of muscular tractions in particular. Rest of the wounded part is the principal condition for a kind and rapid healing. For this reason the surgeon dressing a wound near the wrist puts the hand and arm upon the splint to secure the necessary rest by temporary immobility of these parts. And for the same purpose we bandage *both* eyes after an operation on *one* eye; for as long as both eyes are excluded from sight they remain comparatively motionless, or are at least not subjected to those quick motions they make in looking about. With the action of the ocular muscles thus temporarily suspended and the eyelids immobile the eyeball is afforded all the rest requisite for the healing of the wound. But to keep a man on his back in bed because his eye needs rest is just as irrational as it would be of a surgeon who would put a patient to bed because his hand should have rest. In neither case can the rest of the whole body be of any benefit to the wounded part; but in the case of the eye the prolonged recumbent posture may even have an unfavorable influence by inducing hyperæmia of the ocular tissues.

I therefore agree with Dr. Cheatham (*Arch. of Ophthal.* XIV.-1), that our patients are kept in bed too much. But while

I allow my patients to sit up in chairs and even to walk about the room, I should not let them "walk or ride immediately after the operation or the next day from six blocks to seven miles." It is not prudent to expose a patient after a cataract operation or with a wound of similar gravity to all sorts of weather, nor advisable to send the patient beyond convenient visiting distance; and in our city the sidewalks are not so smooth and level as to make walking an easy and safe undertaking for a blind person.

It stands to reason that the eye should be protected against strong light after an operation; but when the eyes are covered with the proper bandage the light is so thoroughly excluded that it cannot make any difference to the patient whether the room is light or dark; for the attendants, however, it makes all the difference in the world, whether they are imprisoned in a dark room or can enjoy daylight to read and write during these weary hours in the sick room; and for their comfort we should forever abandon the old habit of darkening the room. As long as the operated eye is bandaged, the amount of light is of no consequence; but when the healing has progressed so far that the bandage may be dispensed with, we must take care that the eye is temporarily protected against the irritating effects of strong light either by shading the room or by letting the patient wear smoked glasses.

I cannot persuade myself that the sensitiveness to bright light operated eyes show so often, though not always, when left without a bandage, can justly be charged to the preceding bandaging; for though it is true that if a healthy eye has been closed against light continuously for several days, it cannot bear the the full daylight at once when the bandage is removed, it is a fact too that the healthy eye gets accustomed again to the light in a few minutes, while the operated eye under these circumstances gets more sensitive the longer it is exposed to the light. This difference in their behavior, I believe, plainly shows that the sensitiveness of the operated eye must be due to other causes than the bandage, and if we bear in mind that the operation for cataract does not only affect the sclero-corneal tissue and the iris, but involves to a greater or less degree the whole eyeball, we may well understand that while the external wound appears well healed, the deeper structures of the eye may not have fully recovered from the effects of the operation, and that on this account the eye is more or less sensitive to the light.

As to the dressing of the eye after the operation there is also a diversity of opinions. While the majority of oculists are still using pads and bandages, a few (Michel, Chisolm), have recently reduced the dressing to a simple strip of isinglass plaster, and others, like Pagenstecher (Wiesbaden), discarding all dressings advocate the open treatment. I do not doubt that the eyes may get well under every one of these different methods, but which of these secures to the eye the best protection against all possibilities which might disturb the healing process? That is the point to determine, which is the best and safest treatment.

Now, if we do not imprison the patient in a dark room we shall not for obvious reasons adopt Pagenstecher's open treatment, because the constant winking of the eye-lids and the frequent rotations of the eye-ball would necessarily have an irritating and disturbing effect upon the wound. The plaster straps eliminate these sources of disturbance, and, it is claimed, also exclude the light sufficiently so that the patient can remain with comfort in a light room. But the operated eye must also be protected against mechanical insults; and I cannot see that this thin tissue of plaster shall prevent such accidents for instance like the re-opening of the wound on the first three or four days after the operation, if the patient should run his finger against the eye, and this accident is not unlikely to occur considering the great; disposition of patients to finger about the operated eye in order to relieve an itching sensation, or to find out whether it is sore to the touch. I recall at this moment an accident of this kind which happened six days after the operation; the eye had been doing so well, that I left off the bandage over night. At my visit the next morning I was surprised to hear the patient complain of severe pain in the eye which I found very red, watering and tender. The anterior chamber was empty, the aqueous humor oozing from a small opening at the temporal side of the wound. When the patient awoke, he had felt a great desire to rub his eyes, but came down on the operated eye with greater force than he intended, and the consequence was the re-opening of the wound by the blow. Bearing in mind the possibility of such accidents, I cannot accept the plaster dressing as the best treatment. Besides, I have sometimes employed plaster strips in children after needle operations and iridectomies; but I found the oozing of tears loosened their adhesion and rendered them worthless.

None of these objections can be advanced against the regular dressing with proper bandage. The padding with absorbent cotton or other suitable soft material thoroughly excludes the light, keeps the eye-lids and eye-balls quiet, and securely protects the wound against mechanical injuries.

If the proper material is chosen for the bandage, it will not be disarranged by the movements of the head on the pillow. The common flannel roller, I admit, cannot be kept nicely adjusted, unless a dozen pins are used all over the head; but if we take mosquito netting, or Swiss gauze, and wet the bandage before applying, its several turns become firmly adherent when dry, and form an immobile bandage which can neither be drawn to one side nor come loose by any movements of the patient. Since I have been using this material I have never had any occasion to re-adjust a bandage until I wished to renew it, and I usually leave the first bandage at least twenty-four hours, unless for some particular reason it is desirable or necessary to disturb the rest of the eye by an earlier examination. But if the patient is feeling perfectly comfortable, I hold the less the eye is disturbed during the first twenty-four or forty-eight hours the quicker the edges of the wound will be united.

"THE UNDERLYING CONUS."

BY B. ALEX. RANDALL, A. M., M. D. PHILADELPHIA.

Not a little attention has been given during the past few years to one of the appearances occasionally seen at the optic entrance—a form of *conus* so-called—which evidently differs from the other conditions embraced under the title. Fuchs[1] has been the first to place on record a clear-cut view of the nature of this anomaly, and Szili[2] has further developed the view of Fuchs, that it is a congenital anomaly akin to coloboma of the sheath of the optic nerve. Many others have been studying the matter in silence, regarding it as congenital, but unable to satisfy themselves fully as to its nature; while some have looked upon it as a form of the *supratraction of the choroid* of v. Jaeger[3] and Nagel. Since my attention was first called to it as "*underlying conus*" by Dr. Risley, some seven years since, I have carefully studied its various forms, making sketches of many examples of it, and endeavoring at home and abroad to learn the views of other observers. These opinions, however, have been in most instances very vague; and the published notes upon the subject have been so few, that I am tempted to put a somewhat unusual instance of it upon record, both as a preliminary to a further study, and to invite a like investigation by others.

Mary T. ———, aged 12, came on Jan. 6, '85, to my clinic at the Episcopal Hospital complaining of defective sight. In the functional examination Snellen CC could not be read at twenty feet; but at nine feet with the right eye, and at twelve feet with the left she could see the CLX letter. Jæger No. 1, could not be read; but with each eye Jæger No. IV was spelled at three inches. Externally the eyes showed nothing notable, except some insufficiency of the interni.

The ophthalmoscope showed on the right a rather large optic disk, apparently round, with a pigment band, most marked to the nasal side, encircling it. This was everywhere rather irregular in density, while down and out its partially absorbed portion deserved to be called an absorbing pigment conus as wide as the retinal artery. There was a large shelving excavation of the disk, deepest at the centre, with the veins entering at its lower portion. The artery emerged from its centre and passed a little to the nasal side before branching for distribution. At the lower portion of the disk was a whitish, glistening crescent, similar in aspect to the broadened scleral ring so often seen at the temporal margin; but to all appearances *underlying* the lower one-fourth of the papilla instead of stretching beyond its margin. Its reflex was the brilliant, yellowish-white of hard fibrous tissue veiled by the overlying nerve fibres—brighter below than the visible portion of the *lamina cribrosa*, but fading above to a vague curved margin just as the lamina was lost beneath the nerve-bundles. The retinal vessels went over it unaltered in direction; and the retinal fibres, unduly visible as striations, passed in upon the disk unmistakably in front of it. Measurement of its level by the refraction through the overlying striations was hardly possible, yet it was clearest with stronger light and with a concave glass additional to that required to see distinctly the adjacent choroid. An aberrant artery (cilio-retinal) emerged from its temporal portion and with a hook-like bend passed off the disk to be distributed to the lower macular region. The retina was markedly striated, the papilla too red, and the choroid full of pigment-clouds, *i. e.*, its vessels uncovered and the interspaces dark with pigment-heaping. There was much difference of level in the eye-ground; the periphery being visible without a glass, while the nerve and macular region required at least — 2 D. to clear up *any* details. The eye was astigmatic and — 3 D. cylinder additional was needed to give a clear picture.

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[1] "Beitrag zu den angeboren Anomalien des Sehnerven."—*Arch. f. Ophth.* xxviii, 1, p. 139, 1882.

[2] "Der Conus nach unten"—*Centralblatt*, Dec. 1883.

[3] "Einstellungen des diopt. Apparates," p. 61.

In the left eye the outline of the disk was more quadrate, and its excavation was distorted, shelving toward the upper outer margin, with a more abrupt and prominent lip below. The lower nerve-margin was veiled by retinal striation; and the lower nasal margin presented an absorbing pigment crescent. At the outer margin a similar crescent showed more marked absorption. The central vessels were irregular in their course, emerging from under the abrupt lower edge of the *porus*—while an aberrant artery, rising through the temporal margin, curved down to supply the lower macular region. Above and to the temporal side was a glistening crescent as on the other side, differing only in its situation and extent. Its horns seemed more prolonged—that to the temporal side being lost in the broadened scleral ring. Its upper margin seemed to be bounded by comparatively normal choroid, its level seemed lower than that of the choroid as well as of the retina, and even at the first glance its peculiar character was unmistakable. Like the other, this eye showed high myopic astigmatism. A mydriatic was ordered and under its use several attempts were made to measure the error of the refraction—at first with unsatisfactory or contradictory results, due to accommodative spasm and inefficient instillations of the atropia at home. On Jan. 23, the accommodation was at rest, and with each eye—3. D. cyl. ax. 180° (horiz.); gave a vision of $\frac{6}{XII}$ m.—a result confirmed by the ophthalmoscope and retinoscopy. When seen shortly afterwards she was comfortable with her glass, and her vision with it was the same.

Any attempt to enter upon a full discussion of the "congenital conus" would require a number of illustrations exhibiting characteristics and variations not to be found in any thus far published, and must be deferred. Such a publication is promised by Szili, and Fuchs has doubtless added largely to his collection of examples since his return to Vienna; while many others have surely been noting the not infrequent instances of the anomaly. The names which have been employed, however, by the writers mentioned ("Sichel" or "Conus nach unten") would not cover a case such as above recorded for the left eye—while the congenital character of the anomaly, however probable, is as yet unproven. In publishing a case, therefore, which shows the same relation to the rare coloboma at or above the macula, which the more usual forms have to colobomata below the disk, I would urge the adoption of the name used by Dr. Risley, as marking a constant characteristic, often overlooked, of the condition in all its forms.

[The illustrations that were to accompany this article have delayed th issue, and will now have to appear in the December number.]

TREATMENT OF DETACHMENT OF THE RETINA.

BY EUGENE HOLT, M. D., PORTLAND, MAINE.
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The article on the treatment of the retina without operation with a case by Dr. Eaton, of Portland, Oregon, reminds me that since I heard Dr. Mittendorf read his paper at the meeting of the American Ophthalmological Society of 1883, I have treated two cases successfully by the remedies suggested in his paper. Two more cases have been treated by the family physician, which were seen in consultation. One wrote me that his eye had recovered, and in the other I verified the successful result by an examination. These are the only cases that have submitted to the treatment, and therefore I have no failures to report.

The history and synopsis of the details of the treatment of the first case are as follows:

Miss A., aged 64 years, of medium height, stoutly built and rather portly in appearance, had always enjoyed good health and had had no trouble with her eyes, except that connected with nearsightedness, until last June ('84); she then noticed a black speck before her right, the best eye. She was then at a watering place and indulging herself more than usual as regards her diet and the use of her eyes. As the obscuration grew larger and annoyed her more, she changed her diet and abstained from using her eyes in reading, etc. In August the trouble had assumed the form of a dense cloud over her eye, causing her to suppose she had a cataract, and now, two months later, there is not much change.

Examination Oct. 18, 1884.

Whole upper part of the field of vision gone. Ophthalmoscope shows the retina have in a grayish wavy appearance in the inferior part of the fundus, the summit of which is seen best with +3 D., while by causing her to look slightly downward the disc is seen best with —9 D., thus showing a subretinal effusion of over four millimeters in depth. She has concave spherical glasses of 8 D. for both eyes which she has worn quite constantly for ten years, and always saw very much better with her right, the affected eye. By inclining her head forward and a little aslant, vision in R. E., $\frac{2}{\text{LX}}$: c — 5 D= $\frac{6}{\text{LX}}$. L. E., $\frac{1\frac{1}{2}}{\text{LX}}$: c —12 D = $\frac{6}{\text{XII}}$. The treatment was begun on November 3, 1884, by restricting her diet to the simplest possible, consistent with proper nourishment. A one per cent solution of atropine was instilled into her eyes sufficiently to completely control her accommodation. Her movements were confined to two large airy rooms, but she was enjoined to remain most of her time in a reclining position. Both eyes were kept bandaged much of the time. The treatment with pilocarpine began by the hypodermatic injection of five minims of a two per cent solution. On the following day eight minims of the same solution were injected into the temple. This, however, caused so much distressing nausea that an infusion of the leaves of jaborandi was ordered, so that she would get one gramme at a dose. She was ordered to take this several times a day in order to continue and increase, the diaphoresis begun by the hypodermatic injections. By using the hypodermatic injections of the pilocarpine in the temple in doses just short of producing distressing nausea, and allowing her to take freely of the infusion, the maximum effect was produced with the minimum of disturbance. This was continued for twenty days, when the grayish, wavy appearance of the retina, which had been seen to gradually disappear, had entirely gone with restoration of the field of vision, and central vision equal to $\frac{6}{\text{XXX}}$ with 8 D. sph. The vision further improved and with proper glasses she became in possession of vision equal to that which she had enjoyed for years. Expressing a desire to hear from her from time to time, especially if she should experience any relapse, I will quote from her last letter of March 21, 1886:

"MY DEAR SIR.—Now that a year and five months have elapsed since, through your skill, the sight was restored to my eye, thought you would like to know that thus far the sight is as good as when first restored. As time goes on I use my eyes for sewing and reading quite freely."

As regards baths, I allowed the patient to continue her daily sponge bath and directed that her attendant use massage, which latter remedy I think a very important one when judiciously employed, in the treatment of any case where rest is essential to success. The other case was very much like this one in all its features and the details need not be considered. Both were highly myopic and of that class of cases in which the restoration of sight would have been extremely doubtful without the treatment, for the first one, here detailed, had rested and restricted her diet and habits for over two months without any material change in the condition of the eye. When we take into consideration, that, as a rule, these cases go on from bad to worse until the sight is destroyed and the fellow-eye involved in a similar destructive process, and that operative measures are of little or no avail, the importance of this plan of treatment stands out in bold relief to an afflicted class of patients who have had but little done for them. It is extremely doubtful whether any case of detachment of the retina was ever permanently benefited by an operation, or the removal of the subretinal fluid. A careful study of the etiology of this class of cases failed to convince me of the efficacy of any operation for the removal of the subrenal fluid, and although more than twenty cases had been treated before the plan suggested by Dr. Mittendorf had been adopted, with only the reattachment of one retina and the restoration of the sight; yet I feel that my patients received better treatment than though I had done operations for the removal of the sub retinal fluid

A MODE OF DETERMINING THE ABSOLUTE MYOPIA THROUGH THE AID OF GLASSES WITH THE PRISOPTOMETER.

BY H. CULBERTSON, M. D., ASSISTANT SURGEON U. S. ARMY, RETIRED.

In the August number of "THE AMERICAN JOURNAL OF OPHTHALMOLOGY, I published a method of determining the absolute or latent hyperopia with the aid of glasses and the prisoptometer, and without the employment of mydriatics. In the October issue I corrected this article as to the manner in which these lenses act to effect this result.

In this relation, in hyperopia, and also in myopia we wish to ascertain the static ametropia and to exclude the influence of accommodation in the problem, and in both cases the latter is in excess so far as our purpose is concerned. It having been shown that in remote vision the accommodation can be removed in hyperopia by the aid of glasses as heretofore described, and as in myopia the accommodation may also increase (through ciliary muscle spasm,) the myopia; so in myopia the accommodation may be cancelled by the use of + glasses and the static or absolute myopia found without the use of mydriatics in remote testing.

Take a case in illustration, in which the manifest myopia = — D. 10.0, and in which we have found under duboisine = — D8.0 of myopia. It is apparent in this case there is = — D. 2.0 of accommodative myopia. On adding in the holder of the prisoptometer a + D. 7.0 spherical glass, the accommodation will be relieved by this lens and the latter will induce = — D. 7.0 of artificial myopia, and this degree of ametropia added to that found under duboisine = — D. 8.0, will give — D. 7.+ (— D. 8.0) = — D. 15.0, as the sum of artificial and absolute myopia. The image circles of the prisoptometer with this + glass applied are greatly lapped. Adding behind the +D.7.0,—D. 15. spheric. the object circles become tangent and the artificial myopia =—D.7.0 is corrected, as well as the —D.8. of absolute or static myopia.

This result has been realized in practice among a number of examples of myopia in which duboisine was employed by myself.

Cases of Myopia.

Case.

Miss C. æt. 16 years, L. eye, manifest —D. 1. 25.

No. 1.—L. eye, with + 7.— (— 8.) tang. = — D. 1.0.
Duboisine gives — D. 1.25.

Miss B. T., æt. 16. Man. — 1.75 R. and L. eye.

2. R. E. +7.— (—8.5) = — 1.5. Duboisine — 1.5.

3. L. E. + 7 — (— 8.0) = — 1.0. Duboisine, — 1.5 six months ago.

Mr. H. D. M., æt. 38. Man. R. E. — 6. L. E. —5.

4. R. E. + 7. — —11.75) = —4.75. Duboisine — 5.0.

5. L. E. + 7.— (—10.25) = — 3.75. Duboisine —3.5.

Mr. L. R. C., æt. 19 years. Each eye. Man. — 3.0.

6. R. E. + 7.— (—9.25) = — 2.25. Duboisine, four years ago — 2.75.

7. L. E. + 7. — (— 9.25) = — 2.25. Duboisine four years ago — 2.75.

Miss C. A. R. æt. 16 years. Man. R. E. — 2.25, L. E. —1.0.

8. R. E. + 7. — (— 9.25)= — 2.25. — Duboisine — 2.25.

9. L. E. +7. – (—8.0) = — 1.0. Duboisine — 1.0.

Miss J. G., æt. 31 years. Man. L. E. — 1.25.

10. L. E. + 7. — (— 8.0) = — 1.0. One year ago, duboisine—1.0.

Miss M. C., æt. 30 years. Man. each eye — 1.75.

11. R. E. + 7. — (— 8.75) = —1 .75. Duboisine same.

12. L. E. + 7. — (— 8.75. = — 1.75 Duboisine same.

Miss P. R.T., æt. 19 years. Man. R. E. — 6.25. L. E. — 4.25.

13. R. E. +7. — (— 12.75) = — 5.75. One year ago, duboisine. — 6.0.

14. L. E. + 7. — (— 11.25) = — 4.5. One year ago, duboisine — 4.5.

Mrs. H. M C., æt. 28. R. E. Man. — 6. L. E. — 10.0.

15. R. E. + 7. — (— 13.0) = — 6. One year ago duboisine, — 6.0.

16. L. E. +7. — (— 15.0) = — 8. One year ago, duboisine, — 8.5.

Miss M. C. æt. 23. R. and L. E. Man. — 3.5.

17. R. E. + 7. — (—10.5) = — 3.5. Duboisine — 3.5, six months ago.

18. L. E. + 7. — (— 10.75) = — 3.75. Duboisine — 3.5 six months ago.

In cases of myopia not increased in degree by accommodation the manifest and absolute myopia will be equal. In all other cases of ametropia the following may be formulated.

Rule I.-Add + D 7. spheric in the holder of the prisoptometer and behind this place the — spheric which will cause the object circles to be tangent, and deduct the last from the first and the remainder will be the — spheric denoting the absolute myopia.

A CASE OF INSUFFICIENCY OF THE EXTERNAL RECTI MUSCLES.

BY THOS. FEATHERSTONHAUGH, M. D., ALBANY, N. Y.

It is often helpful to our fellow practitioners to detail a case which has given rise to perplexities in its management. With this view, I collate the notes of a case which was of great interest to me, and which taught me a good practical lesson that has been useful to me on subsequent and somewhat similar occasions.

Mr. H., an unusually robust young man, aged about twenty-four years, a college student in his junior year, consulted me in April, 1881, in reference to his eyes. The subjective symptoms which led him to seek advice were pain in both eyes and head, and confusion or even doubling of objects at a distance. He had lately discovered, too, that he could not easily see near objects with his right eye alone, and he knew that the pupil of this eye had become widely dilated. These, with the exception of the blurring of the right eye for near points, were by no means recent troubles, but had existed with more or less intensity from his earliest recollection. The indications of insufficiency of the external recti were well marked. The conjunctivæ were injected, and the eyes had the weary, watery appearance so common to asthenopia. V. of each $\frac{20}{\text{xx}}$, and all glasses rejected. The pupil of the right was as thoroughly dilated as though atropia had been used, and there was incomplete paresis of the accommodation in this eye. I found by the equilibrium test, with a lighted candle at 20 feet from the patient, that it took prisms of 17° to bring the images in the same vertical line. With a red glass over one eye, there was homonymous diplopia, and again prisms, of 17°, bases out, were necessary to unite the images. If an additional prism of 3° was placed over the 17°, making the sum of the prisms 20°, the images immediately crossed over and heteronymous diplopia was produced. No paresis of any of the motor muscles of the eyeball could be detected. I had, as a rule, never consented to operate in a case of insufficiency where the convergent power was so defective. I like to have the internal recti overcome prisms of 40° or more before interference with these muscles. I had the patient, therefore, come in for a week or more daily, to see whether I could not induce a little flexibility of the internal muscles by gymnastic exercises with the prisms. 2° or 3°, however, in addition to the 15° or 17° necessary to neutralize the insufficiency, proved an obstacle that he could not overcome, and we made no progress. Mr. H. had now become so expert in detecting the double images that he was rather worse than when he first saw me, for the reason that the diplopia, which had annoyed him only at times, was now a pretty constant attendant.

I explained the whole matter, as well as I could, to the patient, and told him that I had decided to operate if he gave his consent. In the early part of May I made a pretty free tenotomy of the internal rectus of the left eye. Immediately after the operation there was still homonymous diplopia, but the images were united by a prism of 6°.

June. Eyes feel very much better, and there is far less confusion. I find that there is still diplopia when the red glass is used, but that, ordinarily, binocular vision is maintained. Insufficiency of the externi by Graefe's test 6°. The patient was now going home for his vacation and further operation was deferred until autumn.

December. Patient overcomes prisms of 32° bases out, and unites the images of the candle readily, without the aid of a prism, even when the red glass is used. He can bear a prism of 2°, base in, and hold the images together. The accommodative paresis in the right eye is gone. There is still some confusion of sight for distant objects, but this occurs infrequently and only when the eyes are thoroughly tired.

I saw Mr. H. at intervals during the winter, but since he was getting along very comfortably and hard at work, nothing more was done until May, '82. At this time he had a little respite from college work, and was desirous of completing the surgery upon his eyes before going to his home to pursue his professional studies. I, therefore, made a tenotomy of the internal rectus of the right eye. Immediately after the operation there was slight heteronymous diplopia, but images were united by a little effort, prisms aggregating 25°, with bases out, were overcome by considerable persistence, while the abductive power was only 4°. The next day, finding the crossed diplopia still persisted, I put in one stitch, merely through the conjunctival membrane, which caused slight homonymous diplopia. This condition righted itself after a day or two, and when the stitch came out, I found, by Graefe's equilibrium test, insufficiency of the interni of 2° to 3° at 20 feet, and, of course, more at near range. When cicatrization was complete, the adductive power came up rapidly, and in two or three weeks prisms aggregating 50° were easily overcome, and the abductive power became 6°. All sense of confusion was now gone and the eyes were perfectly comfortable. In the course of my treatment I had used atropia, and found hyperopia of 0.50 D. in each eye. So small an amount as this seemed hardly worthy of correction.

I have lately received a letter from this patient, in which he says that he has been able to use his eyes as freely as any of his friends; that he studies hard without the least sense of discomfort, and feels confident that the eye question, as far as he is concerned, is solved.

There were occasions, previous to the operations, when the strabismus was readily apparent to even an unskilled observer, and at other times the external muscles seemed to have the strength requisite to render the axes of the eyes practically parallel. There was, doubtless, a large amount of latent insufficiency, which, of course, I could not detect by the prisms.

The perplexing point in the case was the utter inability to converge the eyes beyond the point where they were accustomed to stand. The logical inference from this state of affairs was, that if tenotomy were performed, making the axes of the eyes parallel, convergence would be nil. and the patient would be seriously crippled for his near work. The issue of the matter shows that *tenotomy of the internal recti improved the converging power in a very marked manner.* The internal recti had done very little work for many years. The convergence of 2½ metre-angles was sufficient for near work. without any special demand upon these muscles. which had, consequently, lost their elasticity. As soon as they were brought into natural use. they recovered their normal tonicity. Ordinarily 6 or 7 metre-angles of convergent power remain in reserve after the adductor muscles have fixed the eyes upon the near point. This great excess of power is slowly expended. and enables the eyes to maintain their convergence for long periods. In the case under consideration there was no reserve power, because none was needed. The convergence here was a *passive condition*, while ordinarily it is a result of active muscular contraction.

Though I have not recently seen the patient, I have no doubt that the insufficiency of the interni which resulted from the second operation was only apparent, and has entirely disappeared by this time. Mr. H. was so accustomed to make excessive traction upon the external muscles in order to secure binocular vision, that he maintained this effort even when the necessity for it was removed.

The semi-paretic condition of the accommodative apparatus of the right eye was the result, apparently, of the constant wearying strain upon the eyes produced by the disarrangement of the delicate relations normally existing between the accommodation and convergence. Had these functions not been restored there is a possibility that serious organic changes would have ensued.

A CASE OF RAPIDLY GROWING TUMOR OF THE BRAIN—ATROPHY OF BOTH OPTIC NERVES WITHOUT OPTIC NEURITIS.

BY D. M. WICK, M. D., NEW HARTFORD, LA., AND ADOLF ALT, M. D.

R.R. was a farmer, single, æt. 27, with dark hair and eyes, of stout build, and apparently a healthy young man, weighing 160 pound. His family history was good with the exception of some form of insanity, which had manifested itself in his father and a younger brother, some years ago, and which had been of a transitory character. The patient's habits were good: he did not use alcohol nor tobacco. There was no history of syphilis. He had always been healthy, save a severe attack of typho-malarial fever eight years ago. After recovering from this fever he was partially demented for a time. He was of fair intelligence.

In the latter part of last March he complained of pain or aching over the eyeballs, and in the region of the temples. These pains began so mildly and insidiously that he paid but little attention to them. But soon they became persistent and increased gradually, yet they were not severe enough to prevent him from pursuing his daily work, nor to interrupt his appetite, nor cause him to lose sleep. After nearly four weeks of such suffering he applied to me for treatment.

On examination, I found the tongue coated at its base, a whitish yellow; the bowels were tight and the breath fœtid. His pulse and temperature were normal. He complained of pain over the orbits and in the temples. He also stated that his sight was dim, and that he was dizzy at times.

Thinking my patient's system needed renovating, and that effete matter had to be eliminated, and that he, further, was suffering from a latent malarial trouble, I prescribed accordingly. He returned to his work and again came to the office three days later. I found him much the same as on his former visit, excepting that entire loss of sight had taken place in his left eye. Externally both eyes appeared normal. The pain in the temples and over the eyes continued unabated. His temperature was normal, the bowels and kidneys were active. I now saw that I had more than a malarial trouble to contend with, and examined the eye with the ophthalmoscope, but could see nothing wrong except, perhaps, a slightly œdematous condition of optic nerve.

Believing now that there must be some cerebral or meningeal trouble, I prescribed iodide of potassium and small doses of strychnia, and sent him home with instructions to quit work and keep a light diet, as his appetite had now begun to fail. When he came to the office again, two days later, his condition was unchanged, the left eye still sightless.

Desiring to attend the American Medical Association at St. Louis, I advised my patient to accompany me. We consulted Dr. A. Alt, of St. Louis, who made a close examination and placed him on treatment during the week there.

After our return home the patient gradually grew worse, had more pain in the frontal region, became rather listless and stupid; he slept well at night most of the time, and some during the day. His stomach would occasionally reject its contents.

This condition continued until about the 29th of May, when the sight of the right eye became dim, and on awakening the morning of the 31st day of May, he was totally blind. I could now notice that the eye first affected began to protrude and was fixed. He could not move it in any direction. The upper lid drooped. He could sleep reasonably well, and walk around out doors. He became peevish, fretful, morose, and wanted some one to take his life; but was conscious all the time.

Thus he remained week after week, only growing weaker. Both eyes became bulged out, the upper lids drooped. The left eye protruded more than the right, yet before death the right one protruded the most. The exophthalmus was so enormous that it actually seemed as if the eyes would pop from their sockets. The conjunctiva of both eyes became filled with a bloody serum and protruded between the lids, making a most hideous object to look upon. His nose bled frequently; he would blow and pick it to make it bleed, and he would not allow anything to be done to check the bleeding, as he wanted to bleed to death. He grew very obstinate, peevish and stupid, and kept his bed most of the time. About the middle of July he became totally unable to leave it; he now fell into and remained in a semi-conscious condition; but he would complain at times of his head. From now until death he gradually became more unconscious, and passed his water and evacuated the bowels involuntarily. He died Aug. 15.

Dr. D. W. Crouse, of Waterloo, saw the case with me six or seven weeks before death.

AUTOPSY.

August 16, with the aid of Drs. Powers and Donaldson, of Parkersburg, and Dr. J. S. Stevens, of Cedar Falls, we made a post-mortem examination of the head only. After removing the skull-cap, the membranes of the brain were found to be intact and appeared healthy. We began at the base of the brain to dissect or rather roll out the brain *en masse*, and in so doing we made good progress until we reached the anterior lobes of the cerebrum. Here the coverings of the brain broke down, exposing a soft pulpy mass of brain tissue, with here and there a hardened lump, that gave a gritty sensation to the touch. Some of these lumps or chunks were an inch or more in diameter, and irregular in shape.

The whole anterior part of the cerebrum was diseased, and the membranes destroyed, the diseased condition gradually merging into the healthy tissue. The orbital plates were entirely destroyed and the orbits were filled with the same tissue observed in the anterior portions of the brain. The optic nerves appeared intact, but surrounded with diseased tissue. I sent brain and globes to Dr. A. Alt, of St. Louis, who will give the result of his investigations.

ADDITIONAL REMARKS.

BY ADOLF ALT, M. D.

I saw Mr. R. R., the patient of Dr. Wick, for the first time May 6, 1886. The conditions were then as above stated, L. E. V. =0. The ophthalmoscope revealed a very slightly œdematous outline of the papilla, which itself was hyperæmic. The retinal arteries were very thin. The R. E. showed nothing pathological. The question which arose was whether we had to deal with a simple retro-bulbar neuritis, or an intra-cranial affection. The frequent, almost continued, headaches he complained of rather pointed to a cerebral disease. Yet, the absolutely normal appearance and vision of the right eye, seemed to speak against anything like a cerebral tumor.

I made a trial injection of gr. $\frac{1}{10}$ of strychniæ subnitrate, after which he had at least a distinct perception of a candle light close to the eyeball. (I may here state, that in another case of undoubtedly cerebral tumor with a high degree of optic neuritis and seemingly total blindness, several such subcutaneous injections of strychnia, brought vision temporarily up from 0 to $\frac{8}{cc}$. This patient soon after died from her tumor.)

The history of the case, as given by Dr. Wick, made it soon plain enough, that we undoubtedly had to deal with a cerebral disease, but the extremely rapid growth, which became manifest by the invasion of the orbits and the rapidly progressing exophthalmus, was rather startling.

The specimen, so kindly sent to me by Dr. Wick, showed that the tumor, after having destroyed, the anterior lobes of the brain, the thalami optici and the chiasma nervorum opticorum, had broken through the walls of the orbit and filled the orbital cavities. Both optic nerves were thus embedded in the tissue of the neoplasm. Near the eyeball the tumor has not invaded them, but for the distance of about one-half inch from what would correspond to the apex of the orbit towards the eyeball, both optic nerves are invaded by the elements of the tumor, and the nerve fibre bundles are greatly diminished in number and size, or, in other portions, have totally disappeared. The orbital portion of the tumor shows a great many blood vessels. The right eyeball shows a necrosis ulcer of the cornea, which is just ready to break through. The left cornea is also ulcerated, but has been perforated; the iris has prolapsed, the crystalline lens is wanting, and the retina is totally detached.

The elements of the tumor are uniformly medium sized round-cells, among which lies here and there a giant-cell. There is an abundance of capillaries in some portions, and in others an alveolar arrangement of the cells caused by tracts of dense connective tissue. The orbital portion contains a great many microscopical spiculæ of bone-tissue, which are the remnants of the orbital walls, and not, I think, newly formed, since they are only surrounded by the round-cells of the tumor, and no osteoblastic cells are to be found.

The anatomical diagnosis would, therefore, be *round-cell-sarcoma.*

The histological changes in the tissues of the eye-balls are of no particular interest.

The interesting features of the case are the rapid and enormous growth of the neoplasm, especially, if we take into consideration what an obstacle had to be overcome in the shape of the bony walls of the orbits, before these cavities could be invaded, and the fact, that blindness had occurred, before any very noticeable degree of choked disc had had time to make its appearance. This latter fact would seem to prove that the tumor originated in or very near one of the optic nerve tracts (probably the thalamus opticus). Yet, there was no hemianopia of the right eye even at the time when I examined the case.

CLINICAL OBSERVATIONS.

BY DR. PAUL B. WALDMAN, READING, PA.

I. Astigmatism after Tenotomy of the Internal Rectus.—Miss A. Y., æt 18 years, presented herself Nov. 1, 1885 with convergent strabismus of the left eye. Upon examination of the vision and refraction, the following result was obtained.

R. V. = $\frac{15}{\mathrm{XV}}$ +; E.

L. V. = Fingers at eighteen inches. No improvement with glasses.

Ophthalmoscopically the left eye has H. = 2 D.

Under atropia R. V. = $\frac{15}{\mathrm{XV}}$ w. + 5 D.

Tenotomy was performed on the squinting eye on Nov. 5, and on the right eye Dec. 11, with straight eyes as a result.

On June 20, 1886, she presented herself, stating that since the operation she could not see as well for distance as before the operation, and that she was unable to perform near work with comfort. Upon examination it was found that marked astigmatism existed, viz.

R. V. = $\frac{15}{\mathrm{XL}}$; $\frac{15}{\mathrm{XV}}$ + w. — 1 D. cy. ax. 180°.

I am unable to state in what proportion of cases astigmatism follows tenotomy, but am inclined to think it would be found to exist more frequently after free tenotomies, if looked for; i. e. astigmatism of less degree than in the above case, probably from .25 to .5 D.

II. Eserine Salicylate in Accommodative Asthenopia.—We often meet cases in which the symptoms of asthenopia continue (perhaps in not so marked a degree) after they have been fitted with suitable glasses. I refer to cases without any disturbance of the general health, or insufficiency of the recti muscles; the trouble apparently being due to a want of tone in the ciliary muscle or its nerve supply.

For some time I have been using salicylate of eserine in addition to suitable glasses, in these cases, and with marked success. I use from one-half to three-fourths of a grain dissolved in one ounce of a saturated solution of boracic acid, as a collyrium at bed-time; being guided by the sensitiveness of the patient.

The remedy seems especially indicated where the pupils are large and sluggish.*

III. PROFUSE HÆMORRHAGE DURING THE OPERATION OF EXENTERATIO BULBI.—E. M., æt. 29 years, a robust and healthy man; has never had more than perception of light in the right eye.

On July 18, 1886, he received an injury from a large piece of iron striking the eye. He was treated elsewhere until he presented himself to me on Aug. 10, with symptoms of sympathetic irritation.

Besides atropine and hot fomentations, I gave him a hypodermic injection of pilocarpine daily, with slight improvement. The eye then remaining in the same condition, I advised removal of the anterior part of the globe, and wiping out its contents, to which he readily consented.

On Aug. 25, I performed the operation of exenteratio bulbi. There was no unusual bleeding until I began to tear the choroid from the sclerotic, when profuse arterial hæmorrhage set in, necessitating the completion of the operation while the hæmorrhage continued. Cold and pressure were then applied, which checked the flow of blood. I estimated the loss of blood to have been about ten times that occurring during an ordinary enucleation.

The eye made a good recovery with a favorable stump.

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*The use of myotics in those conditions has some five years ago been advocated by Dr. John Green of this city in a paper read before the American Ophthalmological Society. (Editor).

RETINOSCOPY IN EXTREME DEGREES OF AMETROPIA.

J. H. THOMPSON, M. D., KANSAS CITY.

By far the most difficult chapter of ophthalmology is the one on refraction and accommodation of the eye. Thanks to the labor of Donders, and others, the specialist to-day is better prepared to remedy the different errors of refraction, and in many instances able to appreciate the danger and annoyances such abnormalities may occasion. To properly fit a pair of glasses, or spectacles, is indeed an art, even if it be a in simple case of hypermetropia. But to correct by lenses, either simple or compound, the different grades and characters of nearsghtedness, so that comfort is secured and the danger of progression removed, is an accomplishment. Such a task is often extremely difficult; without the aid of the ophthalmoscope it is well-nigh impossible. As a rule, high degrees of myopia cannot be measured by that instrument; we may approximate the amount of error, but cannot be certain that our measurement is exact. In many instances this method of estimating the error of refraction is more than difficult, because myopia greater than $\frac{1}{4}$ is usually complicated by regular, less frequently by irregular, astigmatism, and as a rule such eyes are amblyopic to a varying degree. I think this is yet more apt to be the case in high degrees of hypermetropia. In theory, it is possible to make an accurate measurement of such conditions, but in practice, we all know it is very different. The same elements of uncertainty meet us if we attempt to measure ametropia of a high degree by trial-lenses and test-types. What I have said of measuring the refraction with the ophthalmoscope is equally as true for this method. The cause of the difficulty lies in the amount of amblyopia usually found in high degrees of ametropia. If $\frac{20}{XX}$ vision is to be considered the only indication of correctness, a very large per cent. of myopes must wear unsuitable glasses, and in consequence would be in danger of progression and insidious intra-ocular inflammations. In fine, I mean to insinuate, that it is impossible in many cases of high degrees of myopia or hypermetropia to find the exact degree of refraction by the methods generally in use; that in, myopia, (either simple or compound), uncertainty often leads to an only approximate correcton by glasses, and guessing in this regard is not only annoying to the surgeon but harmful to the patient. In the Section on Ophthalmology and Otology at the last meeting of the American Medical Association, Dr. Jackson, of Philadelphia, presented a paper on "Retinoscopy." In the discussion, I made the remark that I believed that method of investigation would prove of great value in measuring the refraction accurately in cases in which with the ophthalmoscope and trial lenses we were uncertain.

The method of "Retinoscopy" is somewhat new, and of course by some will be extolled beyond all others in the fitting of glasses. I am inclined to believe that it will be abused by being practiced on all cases, and, contrary to the opinion of some, I do not think in general use it will prove advantageous. In low degrees of ametropia it is not only tedious, but even not so certain or convenient as either the ophthalmoscope, or test-lenses. It is in very high degrees of ametropia that retinoscopy is of the greatest value. Inasmuch as by this method we can dispense with the help of the patient, and inasmuch as the depth or shallowness of the eyeball is an aid rather than a detriment to its practice, I am convinced that it will not be long before the "shadow test" will be universally used in these cases. As a supplement to these remarks I desire to report three cases of extreme myopia measured by this means.

COMPOUND MYOPIC ASTIGMATISM.

CASE 1. Miss DeC., age 26.

The patient stated that when a young girl she could see well (?) Then at school she had no trouble to read or take part in the blackboard exercises. When about ten years old, she found that her eyes began to fail her, and that she was compelled to use glasses for distant vision. The spectacles she changed frequently, finding that it became necessary to get stronger ones at short intervals; finally the strongest failed to suit her. She visited a specialist, but the spectacles he ordered caused so much discomfort that they were discarded. Finally, it became impossible for her to sew, or read longer than a few minutes at a time. When the lady consulted me the pupils were moderately dilated. Her eyeballs, from external appearance, did not seem to be elongated. Motility good.

I tried to find the degree of myopia by trial lenses, but because of the astigmatism and the large amount of amblyopia I could not. I again made an attempt after having instilled atropia, but the best I could get her vision to was $\frac{20}{LXXX}$. I could not measure the refraction with the ophthalmoscope, for I must admit my inability to see the fundus distinctly when the myopia is greater than $\frac{1}{3}$. Even if I could have done so, the astigmatism in this case would have made it well nigh impossible. There was large posterior staphyloma with patches of pigment scattered about the edge. Otherwise the interior of the eyes was normal. Because of the rapid progression it was imperative that the exact condition of refraction should be known. I now tried retinoscopy, and in a very few minutes I found a compound myopic astigmatism—14 D. ○ — 3.5 D. cyl. over 180°, same in both eyes. Thus combined glasses gave a vision of $\frac{20}{XL}$.

I prescribed —10 D. ○ —3.5 D. cyl. 180° for distance; —7 D ○ —3. 5. cyl. 180° for reading. These spectacles gave satisfaction, although the total myopia was not corrected. I thought it best to be on the safe side, even at a slight sacrifice of distinct vision.

COMPOUND MYOPIC ASTIGMATISM.

CASE NO. II.—Mary M., æt. 17. Nothing unusual in the appearance of the eyes other than a moderate dilatation of the pupils. On account of a marked degree of amblyopia the face had a rather foolish expression, otherwise the girl was in a good condition, both mentally and physically. She said she never saw distinctly, and within the last two years vision had grown much worse. Reading and sewing caused pain; all nearwork was badly done because of the increasing blindness. Several persons had given her glasses but none fitted her. The inverted picture of the fundus showed posterior staphyloma, slight pigment alterations, but no sign of acute trouble either in the choroid or retina. It was impossible to make out any of the details by the direct ophthalmoscopic observation. I could see, however, that there was considerable astigmatism. With trial lenses, simple or compound, the examination was very unsatisfactory. There was so much amblyopia, that $\frac{20}{C}$ was the best vision I could produce. On account of the extreme degree of myopia and the comparative blindness, I felt it was very necessary to know the exact refraction. Retinoscopy gave it in five minutes. Both eyes: —12 D. ⌢ 2.5 D. cyl. 180°. After atropia reads at 8 inches, with —7 D. ⌢ —2.4 D. cyl. 180°. Advised to keep up the atropia for one month. Prescribed compound glasses fully correcting ametropia for distance. These glasses gave satisfaction, and can be used for hours without pain or annoyance.

COMPOUND MYOPIC ASTIGMATISM.

CASE III.—Master L., æt. 13.—From the number of the glass the young man wore when he entered my office and that which he accepted, I was inclined to think that he had either been very badly fitted, or that there had been dangerous progression in his myopia. He said that six months ago his spectacles fitted him, and that at first he saw quite well (?), but of late his vision had grown rapidly worse. Because of extreme amblyopia or much irregularity in the astigmatism. I could not satisfy myself with the trial lenses with regard to the exact refraction. To see the fundus and measure the refraction with the ophthalmoscope was simply impossible. I then tried retinoscopy, and found —7, 0 D. ⌢ —5. 0 D. cyl. axis 180°. This combination made V = $\frac{20}{LX}$. No other glasses would do as well. I ordered

—7, D. ○ —5. 0 D. cyl. 180° for distance, and advised that the eyes be absolutely rested for one year.

These three cases I have reported because I believe they fully demonstrate the usefulness of retinoscopy. I am not enthusiastic over this method of examining the refraction, but I do believe, that in some cases of ametropia and in some respects, this is the best means we have to secure a perfect measurement and correction.

REVIEW.

A COMPEND OF THE EYE; INCLUDING REFRACTION AND SURGICAL OPERATIONS. By L. Webster Fox, M. D., and G. M. Gould, A. B., Philadelphia, P. Blakiston, Son & Co.

We have received an advance copy of this little quiz-compend with the above title, which has for authors two of our collaborators, and is No. 8 of a series of quiz-compends published by the firm of Blakiston.

It gives in a very condensed and clear form the most necessary points on the subjects it treats upon. The text is well arranged and subdivided. It has, furthermore, a great many excellent illustrations, which heighten its value for the student, to whom, we think, the little book is especially to be recommended.

There is a number of points in it with which we cannot quite agree, but which on the whole do not, therefore, detract any of the value of the little work, which in many places shows the originality of its authors.

The authors, for instance, say: "Epilation should be repeatedly tried for distichiasis and trichiasis before trying the surgical operations." Why ?—They recommend to slit the *lower* canaliculus in dakryocystitis. We think the upper one preferable.—They call military and Egyptian ophthalmia a synonym of *purulent* conjunctivitis, but never mention these names as synonyms of trachoma, where they more properly belong, although a chronic purulent conjunctivitis *with* the formation of follicles has also been given these names.—The passage on diphtheritic and croupous conjunctivitis does, it seems to us, not do justice to these important forms of conjunctivitis.—In the treatment of trachoma sulphate of copper, the most reliable remedy in our opinion, is not even mentioned, and in the less malignant lupus alum crayon is recommended, which we think not worth the mentioning.—The authors make a distinction between hysus, *tumors*, epitheliomata and sarcomata of the conjunctiva. This is probably a slip of the pen.—They say that anterior synechia *rarely* happens, except in injuries. *Ulcers* of the cornea seem to have been forgotten.

The authors think pyramidal cataract *rarely* congenital. The general opinion is, that it is mostly so. Nor lies the exudative material which forms the cone *upon* and outside of the anterior lens capsule, as the authors state; on the contrary, it is always enclosed *within* the lens-capsule.

The *only* treatment given for detachment of the retina is the tapping of the sclerotic.

No other method of cystotomy is mentioned but a quadrilateral one.

The consequences of the presence of a foreign body in the vitreous are said to be in the following order: hyalitis, *glaucoma*, retinal detachment and *even* sympathetic ophthalmia.

We herewith draw the attention of the authors to these different points selected at random, because we think their correction will enhance the value of the second edition which, we heartily wish, will soon follow this first one. ALT.

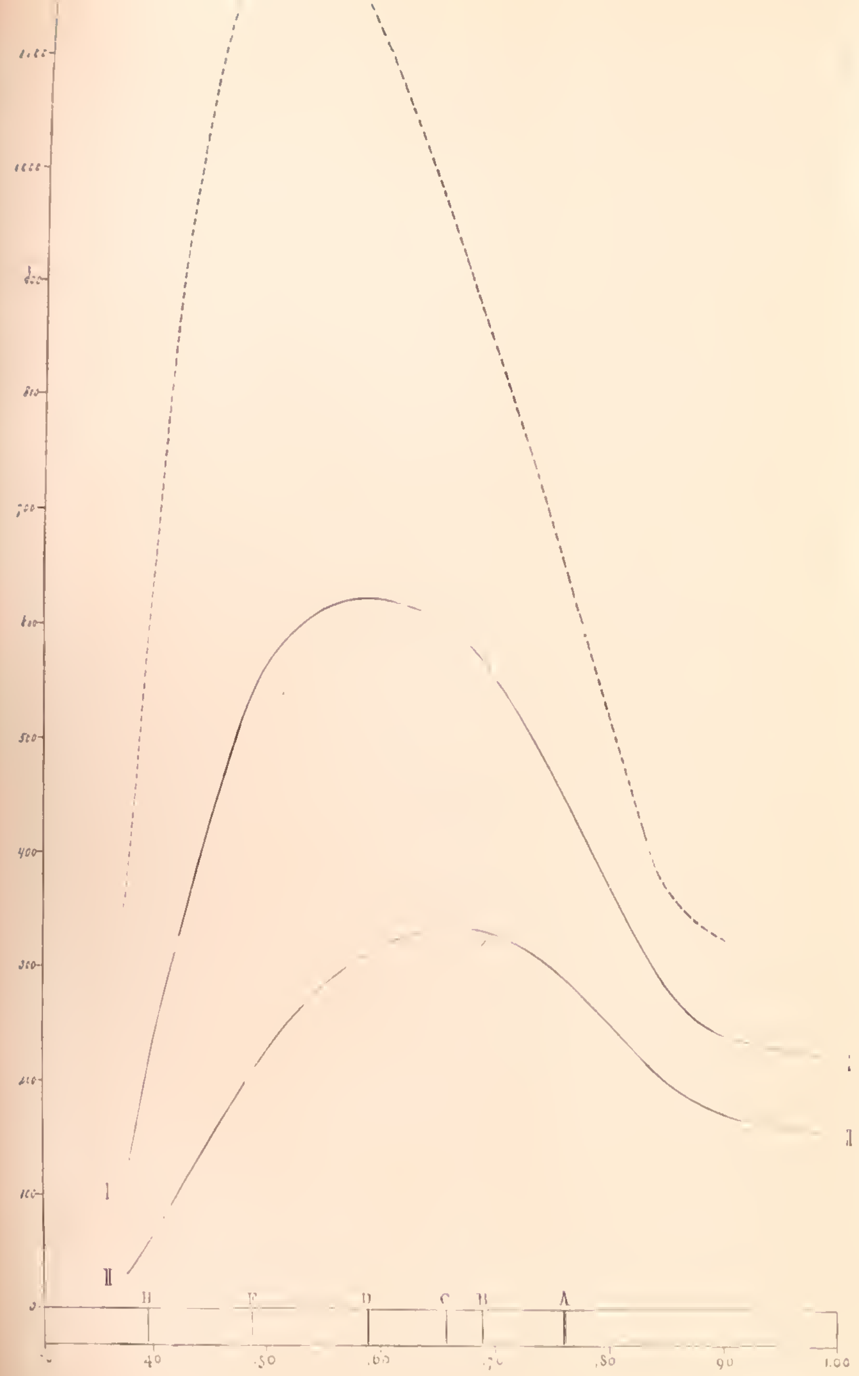


FIG. 21.

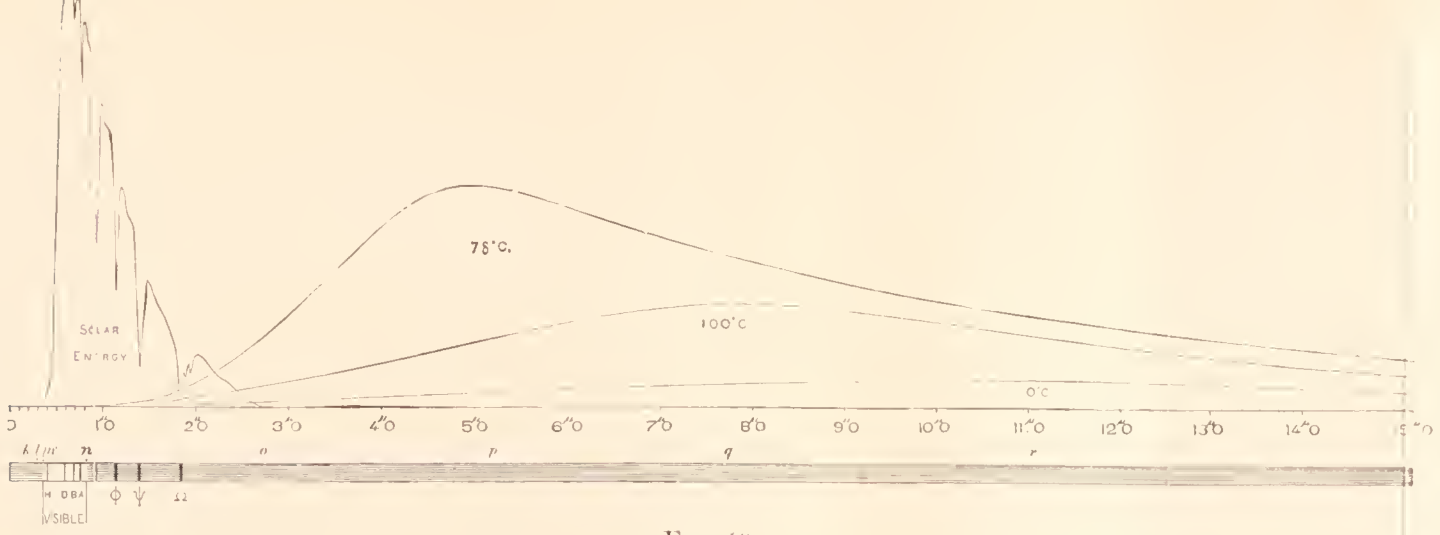
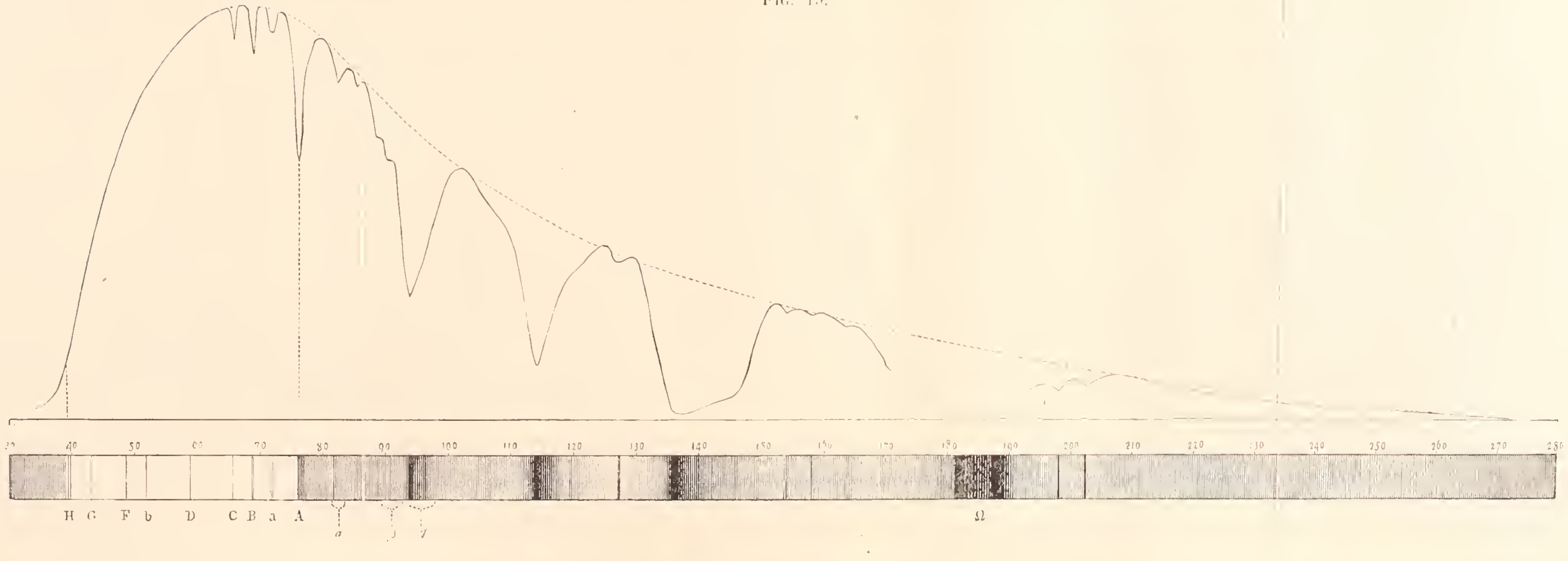


FIG. 19.



NORMAL SPECTRUM.
FIG. 20.

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RETINAL INSENSIBILITY TO ULTRA-VIOLET AND INFRA-RED RAYS.

BY L. WEBSTER FOX, M. D., AND GEO. M. GOULD, A. B.

We have received from numerous friends and correspondents many queries concerning the questions discussed in our articles in the July and September numbers of this journal, and they are nearly all connected with an indistinctness or entire misapprehension of the real character and extent of the relative energies of different parts of the spectrum; there appears to be a want of clearness as to the essential nature of the retinal stimulus, and this indefiniteness seems to sum itself up in the question, "Why does the retina fail to respond to the ultra-violet and the infra-red ethereal vibrations?" To avoid the labor of repeating much the same answer to many, we beg the reader to excuse the intrusion of another communication in which we desire to give a *résumé* of relevant facts, and such hints of explanation as with the existing state of science seem possible.

LIMITS OF ETHEREAL WAVE-LENGTHS THAT HAVE BEEN STUDIED.

A glance at FIG. 1[1] shows the measurements of the waves that have been studied. The figures 1, 2, 3, etc., give the wave-length in *microns*, (μ), or one-hundred thousandths of a millimetre; the heights of the curved lines give the relative values in heat units, or the relative absolute energies of the different spectra compared. The visible and invisible solar spectrum is the first to the left and extends from wave-lengths of a size of about one-third of a micron to those nearly three in length. The other curves represent the vibrations proceeding from terrestrial bodies heated to the degrees indicated. The first and most interesting fact that appears from this extremely condensed representation is the discovery it shows of the extension of our knowledge of wave-lengths into regions hitherto unknown. We now have knowledge of undulations eight times the lengths known to Newton; and this is due entirely to Prof. Langley and his marvelous bolometer, by whose aid he measures a degree of disturbance less than the $\frac{1}{10000000000}$ part, a delicacy of estimation so utterly beyond comprehension as to seem fabulous. The approximate estimate of minimum value assignable to the longest wave recognized by the bolometer in any heat from a rock-salt prism is given as 0.030 (units of a mm.) whilst the length of the shortest sound-wave corresponding to the highest musical note perceptible by the human ear (about 48,000 vibrations per second) is 14.0. So that, though the gulf between the shortest ærial undulation and the longest known ethereal is still a wide one, it is far less than before, and practically inconsiderable and uninteresting, except to the student of physical geography.

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[1] The illustrative cuts accompanying this article are printed from plates kindly loaned us by Prof. Langley and the proprietors of the *American Journal of Science*. Our indebtedness to Prof. Langley and his most valuable researches is too evident to require notice. But our own gratitude to that eminent scientist is only a small fraction of that given him by science-lovers in general and light-students in particular.

The smallest waves that have been measured are the extreme rays from aluminum in the induction spark,estimated at 0,185 μ. Of the solar radiations, the shortest that penetrates our atmosphere is 0.29 μ. The shortest visible to the naked eye is 0.35 μ, though by the aid of the fluorescent eye-piece of Soret, by photography and quartz trains,vision has of late been greatly extended.The longest waves to which the retina responds are about 0.81 μ, and the longest solar vibrations that penetrate our atmosphere are 2.7 μ. Thus we see that the range of vision (from .35 μ to .81 μ) is a little over one octave. All this is roughly shown in the figure (I) referred to. Let us now spread the solar spectrum out so to study it more exactly. This is done in FIG. II:

The Normal Solar Spectrum

is here extended so that we have in about 12 inches a graphic delineation of what was before crushed into one-twelfth the space for purposes of comparison. In this way we get a comparative view of relative values of the visible and invisible spectra. At this point it may be well to throw in a word of explanation as to the unit of measurement used, or of the proper meaning to be attached to the broken curve; it represents the abstract kinetic value or absolute energy contained in the radiations apart from all considerations of the receiving substance. Much of the confusion existing concerning these questions arises from many misleading or positively absurd diagrams in old text-books or articles devoted to the "plebification" of knowledge concerning these matters. It is now agreed that the kinetie value of all ether waves is measurable in terms of heat, and that the greatest energy of the spectrum is in yellow; at high noon it is about wave-length 0.55 μ, whilst about sunset it is near wave-length 0.65 owing to the increased absorption of the shorter waves by the greater thickness of the atmospheric layer. The difference of effect produced by an impinging series of ether-waves arises solely from the merely accidental nature of the receiving medium. The energy of the ultra-violet rays is so small as to be almost infinitesimal, but because these rays happen to correspond in beat to the vibrational frequency of the molecules of the haloid salts of silver,and the highly imporportant consequences resulting therefrom in the art of photography, their importance in an absolute or in a visual sense has been greatly overestimated. It is a startling fact that a photograph can be taken by the aid of these vibrations in a room absolutely black and without light to a normal eye. It has been a popular fashion tocall these rays actinic, and the infra-red, "heat" waves; those be-tween, "light" waves. But every ray whatsoever is a heat ray, and the rays producing the greatest heat are precisely those producing, when falling upon the retina, the greatest visual effect. The energy-cure, the heat-curve,and the light-curve are in great part identical, and the apex of this curve is about wave-length 0.55,great as shown in the diagram. Thus a nomenclature that does not presuppose any theories, or unconsciously mislead the mind, is to call these three divisions by the simple names, ultra-violet, light, and infra-red.

RELATIVE ENERGIES OF THE THREE DIVISIONS.

The kinetic value of the ultra-violet rays is for our purpose too insignificant to consider. It is estimated to be not $\frac{1}{100}$ that of the infra-red rays. The enormous importance of these last has been unnoticed because of the great compression of these rays by the prism, and the inability hitherto of scientists to measure their values. At the present time, however, this portion of the sun's rays is estimated to include nearly $\frac{2}{3}$ of the total energy of the solar radiation penetrating our atmosphere. The exact figurəs are given as follows:

Luminous and ultra-violet energy, -	0.368.
Infra-red energy, - - - - -	0.632.
	1.000

THE INFLUENCE OF ATMOSPHERIC ABSORPTION.

This is a highly important point, and needs careful consideration. In a word, the breaks and sudden dips of the energy-curve shown in the figure are due to the varying powers of absorption exercised by the solar or telluric atmospheres upon the rays in their passage through them. Speaking generally, the absorption increases with the decrease of the wave-length, viewing the spectrum as a whole, though there are local regions of exceptional absorption. The extent of the atmosphere's absorbent power upon the infra-red rays is strikingly shown in the jagged peaks and chasms of the line all the way from Fraunhofer line A., near the limit of visibility, to the end of the solar spectrum. Considering the visible spectrum only, it is found that in penetrating our atmosphere the light rays suffer a relatively larger loss than the infra-red. The atmosphere is also a better transmitter for the light-rays in the winter-season. The general effect of this atmospheric function is to move the maximum energy-point of the spectrum toward the red-end, so that our atmosphere plays the part of an orange or reddish glass. The larger particles of the great dust- and vapor-shell surrounding our globe produce a *general* absorption, rendering the whole spectrum less bright and less hot; with infinite degrees this manner of absorption passes into what may more specifically be called molecular, producing the dark telluric lines of the spectrum. The number of these lines increases rapidly from noon till at sunset the spectrum is crowded with them. In ascending a mountain many of the telluric lines fade out even from the spectrum of high-noon at sea-level. We get nearly as much light from the sky on an average as from the sun direct, and the total value of this absorbent power of the atmosphere is concluded by Prof. Langley to be as high as 40 per cent., double the estimate of all previous investigators. If, then, we could, with our eye as at present constructed, rise above our atmosphere, the sun would appear distinctly blueish, because the maximum energy-point of the spectrum would at this elevation be in the (at present) green part of the spectrum, our white light being a compound of only a part of the visible solar-rays, many of the longer ones having been quenched by the atmosphere acting like ever-present reddish semi-transparent spectacles. Fig. III gives a representation of the energy or heat curves of the visible spectrum, 1, outside our atmosphere; 2, within the same at noon, and 3, just before sunset. The apex of the curve is seen to be farther toward A. with each increase of atmospheric depth. Beyond our atmosphere it is at about wave-length 0.50 μ, whilst at noon and evening at sea-level, it is, as we have seen, at about 0.55 and 0.65 respectively. It should be borne in mind that though the light rays suffer a far larger relative absorption than the infra-red, the apex of the curve nevertheless remains comparatively unfissured and is always elevated far above any of the peaks of the infra-red rays.

THE EXCLUSION FROM VISUAL PARTICIPATION OF THE ULTRA-VIOLET AND INFRA-RED RAYS

seems natural from a glance at either of these diagrams, but especially so from the first and second. In a sentence, it is because the eye has learned to react to the strongest and most constant stimulus or classes of stimuli, and has learned to extinguish or exclude those vibrations that would only confuse by their weakness or inconstancy. Consideration of the difficulty of focalizing rays of wide differences of refrangibility must also not be forgotten. Were the extremes not shut out, chromatic aberration would certainly be more of a disturbance than at present; and, that the "difficulty" is real is also shown *e. g.*, by the fact of presbyopia. The inelasticity of the lens is complete before old age is reached. First, as to the ultra-violet, the insignificance of the total energy of these rays is perceived by noticing the tiny curve and extent of activity of these undulations figured in the little triangle beyond H. of Fig. II. Not only is the energy too inconsiderable to produce sufficient organic reaction of the ocular mechanism, as compared with the adjacent red space, but the varying quantities of such rays, resulting from the ever-changing remnants left over after the absorptions of the atmosphere have been satisfied, renders constancy of stimulus impossible, and the eye naturally fails to develop response to stimuli, or excludes them from the retina, because they are so weak and capricious. We must, moreover, not fail to recollect the exaggerated importance and mistaken supposition of extent of the rays of this part of the spectrum, naturally engendered by their influence in photography. A line must be drawn somewhere by nature, and the remarkable fact seems to be that the violet rays should not have been excluded from color-production. The limitation of the chromatic scale should not be a cause of critical complaint, but its extension is rather a source of delighted wonder.

In considering

THE INFRA-RED RAYS,

so rich in the total amount of energy and so magnificent in the extent of their wave-lengths, it would at first blush appear that the preceding considerations could have no force or application; but this is a mistake. We think exactly the same reasons sufficient to account for their non-participation in vision. Observe first, that though three-fifths of the total energy of the spectrum is in this region, it is spread over a space six times as great. Now it is apparent that amplitude of range beyond a certain necessary and satisfactory amount, would be of no advantage. How ever great a spendthrift nature may seem in certain directions, she is still a more niggard economist in others. Extension of the visual function to these regions would imply immense complication of ocular and cerebral mechanism, a complication and intricacy that if in any way possible, would hardly give any considerable advantage to its possessor.

In the next place we must note that this great stretch is one continuous succession of peaks and valleys, or in other words, that its energies are not constant and regular. Cool places alternate with hot ones, and though the shorter wave infra-red peaks are as high as some parts of the visible curve upon the other side, they are not regularly so, and during a fall of the general supply of the radiant energy, as in an obscure day, or in the morning or evening, these valleys would drop down to a level where their maximum of energy would be very small or even *nil*. And this matter of a continual pulsation of the general amount of the stimulus must be borne in mind. It is not a sufficient argument to say that the great space from 0.80 to 0.90 contains an energy as high as that between 0.40 and 0.50. Upon this last side of the curve there is no valley at all, whilst just within A we have a tremendous one that with diminished general illumination would make a break, sharp and decisive, between the two visible portions. *Natura non facit saltum.* Nature is no giant such as Cruikshank and his fairy story picture, striding from mountain-top to top at one step. The existence of this deep and cañon-like chasm at A seems to us highly suggestive. At this point nature seems to have called a halt, and set up there the boundary line of visibility. This gap seems to have served as a legitimate excuse to set bounds to the hungry cry of the organism for greater pre-emption and extension.

Had this cool notch not have existed, it is easily conceivable that the retina might have learned to react to the stimulus extending so far as wave-length 0.95, or even to the next great cool space at 1.15, had there likewise been no such fall as is seen at 0.95. But the great ebb and flow of radiant energy every twenty-four hours, complicated always, and rendered more highly inconstant by the varying conditions of atmospheric cloud and dust, of shade, of vegetation or hill, of longitude and equinox—all these sources of variation and inconstancy served to show the hard tasked ocular and psychic mechanician that he could only rely with confidence on that part of the spectum, upon those wave-lengths that, under all conditions, were strongest and most persistent. His creatures had to gain the best intimations possible of external objects during foggy and cloudy days, in twilight, moonlight, nay, even by starlight, and at these times the reduction or even extinction of energy in the infra-red regions would be too great or too common to give such indications. Hence the necessity of ignoring them.

We spoke in metaphor of the task of the creation of the retinal and cerebral response being a difficult one. No anthropological or teleological *arriere-pensée* was in our mind. We are as shy of that sort of thing now-a-days, as our fathers were fond of it. What was meant was simply this: None but they who have deeply studied and pondered the delicacy of the force of these ethereal stimuli, have any but the most absurdly inadequate conception of their almost infinitesimal littleness. Prof. Rowland has ruled 160,000 lines to the inch in his concave gratings. The finest slit admitting a beam of light to this grating is one-fifth of a millimetre wide, yet this covers more than the distance between the two D lines, and in this space there are at least a dozen alternations between brightness and extinction. The astounding sensitiveness of the bolometer is far from discerning the absolutely homogeneous ray. Now it has been shown (by *Nichols*, *Amer. Jour. Sci.*, Oct., '84.) that the retina responds to an exposure to rays, (from the pigments of a Maxwell-disk) lasting only 0.00144 of a second. This was the time for yellow, and at the brightest of three degrees of illumination. For red the figures were 0.00209, for violet, 0.00286. Experiments with spectra of the solar radiation are still more remarkable. B. O. Pierce, Jr., (*Am. Jour. Sci.*, '83) found that the largest displacement needed by any observer corresponded to a difference in wave-length of about 0.000005 *mm.*, the smallest to a wave-length of about 0.0000005 *mm.* In all these cases, the extreme refinement of response is in yellow—precisely where the stimulus is strongest, most invariable and persistent. But what we wish particularly to emphasize is that the most trained imagination can get only the most impotent and inadequate fancies and glimpses of the marvelous sensitiveness of the retinal mechanism that can react to stimuli represented by the figures above given. Was it therefore not in reality a great feat of the organic mechanic, which, as dethroned Deity we familiarly call Nature, Life, Natural Selection, (we still compliment with capitals—how long will that last?) to develop retinal response, infallibly, swiftly, to such inconceivably fine stimuli? Nothing else in all the domain of the senses can be remotely compared with it, and only because, upon the quick perception of the half hidden gleam of approaching teeth, of concealed enemies, of disguised poisons and fruits—only because, upon the lightning-like recognition of a thousand such subtle and ever varying indications, depended the safety and hourly existence of his creatures in air, earth or ocean, only by and under such prime necessities, could the inconceivable labor have been accomplished! One of our correspondents is puzzled to understand why the retina does not react to the ultra-violet and infra-red waves, the same as carbon and all ordinary absorbers. The question implies a strange analogy and a fatal forgetfulness of the object of vision, the organic needs to which the eye ministers, and the organic means by which this functional activity has been developed. The action of any organic tissue whatever, is only the outcome and epitome of its history. Chemical and mechanical forces have, in this sense, no history; their reactions are always and ever the same; but the moment we have to do with that mysterious somewhat we call life, at least in any but its very lowest manifestations, that moment we can predict the methods and laws of its activity only by a knowledge of the history of the organs through and by which it presents itself to us. Throw light upon the sensitive plate of the photographer, and the silver salts at once go through their paces utterly regardless of the past history of that light, whence it came, how generated, etc. But light thrown on the retina of an ant and upon the retina of a man is perceived as a wholly different sort of stimulus, as Sir John Lubbock has shown, and light from the pursuing hunter, and the self-same quality of light from the coat of its mate prcduce quite different results somewhere in the receptive mechanism of the deer. In a word, as we have elsewhere tried to show, it seems strange that the great laws of evolution and natural selection should be so persistently and successfully used to explain the functions and reactions of other organs, and the visual activity be the last to which these principles are applied. But that delightful class of grubbers who have gone clean daft on materialism, and who would, with sublimely comic impertinence, explain life in terms of mechanics, and analyze a maiden's blush into $(C_{600}H_{960}FeN_{154}S_3O_{177}\ [\text{Hæmoglobin}]) + O + (C_5H_{13}NO\ [\text{“Neurine”}]) = X.$,—Q.E.D.!—these philosophers do not, to be sure, need even these paltry helps of historic study, to demonstrate truth, any more than did Punch's Humpty Dumpty, "who sat on the wall, to his nurse proving he never could fall, etc.'

Besides the facts of the weakness and inconstancy of supply of the infra-red rays, and barring also the immense complication and increase of retinal and cerebral machinery it would have necessitated, we may pertinently ask of what advantage to the great kingdom of developing animal-life would it have been if retinal reaction had been extended to the infra-red rays? All existing objects become visible by means of the light rays; any object that would reflect these infra red rays already reflects the rays of the visible spectrum in sufficient strength and variety to give the visual mechanism full advices of the existence and qualities of the object. May it not be consistently supposed that the effect of these infra-red rays, if allowed to produce visual result would simply be productive of confusion? The object of color may generally be said to be to give evidence of the qualities of objects. Extension of the color-scale and response would not only give no possible advantage to its possessor, but it may be certainly said that such extension would assuredly disadvantage its unfortunate owner in the struggle for existence, not only by complicating the retinal machinery, but also by rendering the organism's response more uncertain and less lightning-like in rapidity.

Do the Ultra-violet and Infra-red Vibrations Reach the Retina or Visual Centers?

In this connection the question arises as to the means whereby the visual mechanism rids itself of the confusion that would naturally follow from the influence of these rays (or the impulses resultant from them) provided these were allowed access to the retina. It has been suggested that the ocular media may act as a strainer, or filter to these wave-lengths, quenching or absorbing their energies so that they do not in fact reach the retina. So far as we know the only definite answer to this question pertains alone to the ultra-violet undulations. A French scientist, M. de Chardonnet (*Comptes Rendus. Tome* 96, p. 144) utilized the power that these rays have to produce chemical changes in the sensitive plates of the photographer, to test the relative transparency of the different ocular media of man and the vertebrates to these rays. The crystalline, cornea and vitreous were tested separately. It was found that the adult crystalline of man quenched the spectral waves between Fraunhofer lines L and M. It required a long exposure of the plate to produce response therein by waves the length of those of line M. The vitreous was transparent to the rays between S and *s*, the cornea permitted weak traces to T. One or another of the media in animals was opaque to rays beyond L or M in the ox and frog, N or O in the fish, P in the cat, R in the calf, sheep and hog, S in the turkey and owl, T or U in the hawk. No eye whatsoever was found transparent to the ultra-solar rays[1], or to those shorter than T or U. So far then, as relates to the human eye, it was found that the vitreous and cornea were transparent to a much greater extent of the ultra-violet rays than the crystalline, and the problem narrowed itself to experiments upon living aphakial eyes. On p. 509 of the same volume of the *Comptes* M. de Chardonnet reports as the results of his experiments upon such eyes that he found the living normal retina sensitive to ultra-violet waves almost to S. Beyond this, of course, it was impossible to test because the cornea and vitreous became opaque at this point. It is of interest to note that the individuals thus experimented upon testified the suggestive fact that their impression as to the color of the ultra-violet rays was that it was of a light blue or a delicate grayish blue hue. A word of explanation also as to why people without the crystalline lens do not complain of the bluish tint of objects[1]. Leaving out of consideration the fact that what habitually colors or changes the proportions or averages of rays so slightly as this, would, from mere habit, drop out of conscious recognition, it may be remarked that the excessive weakness and relatively small amount of the ultra-violet solar radiation reaching the eye would not, except perhaps to the sensitive retina directly after cataract operation, materially change the general tint of a multitudinously compound mass of rays such as naturally enters the eye at any one instant. But far more conclusive is the fact that *without* spectacles there is no emmetropic focalization of rays on the retina, only a multitude of diffusion circles; whilst *with* spectacles (which of course are commonly worn) these ultra-violet rays are absorbed by the glass and never even reach the cornea. Parenthetically, it may be noted that to this circumstance—the opacity of glass to the greater part of the ultra-violet radiation—is probably due our immunity from fatigue and from what would be a novel form of asthenopia or ocular disease arising from the electric light; the incandescent lamp being surrounded by a film of glass quenches those rays that in this light are very numerous and (comparatively) powerful. If this severe and unusual task were thrown upon the crystalline, it is reasonable to suppose a disturbance of its function might probably result.

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[1] That is, to those waves of the electric light which are shorter than any penetrating our atmosphere from the sun.

Referring again to the straining function of the human crystalline, M. J. L. Soret (*Comptes. Tome* 97, pp. 314 and 572) finds that its absorbent power is not, as first supposed, due to the albuminous substance, globuline, forming the mass of the lens, but that it is effected by means of a crystalline substance secreted by the lens. Now, is there not in this fact evidence of a suggestive and convincing kind, since, as we have seen, the ocular media in the lower animals are generally transparent to much shorter waves than in man, that it has been found in the developement of the higher vertebrates, and especially in man, that the admission of the ultra-violet rays to the visual function has been undesirable and their participation in this way (and as it were purposively) guarded against? As the calf's eye was found transparent to shorter waves than that of the grown animal, so it may be predicted that the babe's eye will be found to permit the passage of shorter rays than the adult human eye.

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[1] We may remark that we have had patients just operated upon for removal of the lens exclaim that the objects first seen appeared distinctly bluish in tint.

The reason that different normal eyes are variously sensitive to the waves in the neighborhood of the ultra-violet demarcation-line is thought to lie in the varying degree of fluorescence possessed by different crystalline lenses. The normal crystalline is fluorescent to about the same degree as quinine, or in the higher animals to near Fraunhofer line O, or R.

Whether or not the visual mechanism of such animals as the hawk, turkey, etc., really react to the extremely refrangible rays allowed to pass by their ocular media, it was impossible to learn, owing to the evident reason that the human eye could not see in that "darkness" if motion followed the stimulus or not.

Turning at last to the far more important infra-red rays, we find only analogy and speculation to aid us. We know of no such experiments with these as with those we have just discussed. Here, indeed, photography can be of no aid, and only a thermometer so delicate as Prof. Langley's bolometer could give any result claiming correctness, by passing such rays through the living or but lately living eye, thus testing whether they were intercepted or not, and where was the line of demarcation. This has not to our knowledge been done. But a multitude of objections at once arise. To do this with the living eye is quite beyond possibility, at least with a normally living one, and the coexistence of pathological condition might justly be held to vitiate any result obtained. The objection would gather force as regards experiment upon dead tissues, and the experiments of M. Chardonnet are in this respect open to not a little criticism. The living eye might have a function or be without a function as a wave-filter, that would make the results of experiments upon the dead eye of a highly doubtful character. Moreover, the ocular media as such may be proved not to have this filtering action, and criticism is not checkmated by many moves; the layer of axis cylinders, highly complex and organized structures, of which there are some 800,000 spread out over the concave surface of the globe, may exercise an absorbent or modifying agency; not only does the entering light have to pass through these structures (except at the fovea) but it has also to pierce the still more highly organized and extensive eight or nine distinctly recognized strata of the retina before reaching the tips of the rods and cones or the pigmentary substance into which these extend. It seems wholly beyond the possibility of experiment to determine whether these may not, when instinct with quivering life, exercise an influence upon the transmitted rays. The inexplicable and apparently unnatural arrangement whereby the points of the retinal end organs are turned away from instead of toward the entering stimulus may not be disconnected from this interesting question. It must certainly have been another great task to make so complex an organizism as the retina so wonderfully transparent. Its transparency, however, may only be to the light rays, and it may possibly be wholly opaque to the infra-red. If it were proved that the rays in question do reach the pigment masses about the cone tips, it would conform to the theory of heat as the retinal intermediate that we have previously set forth, to suppose no receptive substance were there secreted whose vibratory phases corresponded to those of the infra-red rays. Lastly, it may not be held improbable that there is retinal response to these stimuli but no neural transmission to the brain; or, supposing there be such reports sent up, that, even as a final resort, the brain refuses to notice intimations that, from their inconstant, weak, or confusing character, are more wisely ignored. A thousand facts of experimental psychology show the cerebral co-ordinating centre to have such powers and to habitually exercise them.

THE RETINAL STIMULUS OF THE LOWER ANIMALS.

An interesting question here presents itself, and may be alluded to in passing: Does the visual mechanism of other orders of animal life differently situated from ourselves respond to other wave lengths than our own? It is beyond question that every body whether solid, liquid, or gasseous, whether what we call "hot", as the sun or a red-hot stove, or whether what we call cold, as ice, is a continuous source of that radiant disturbance to the ether about its particles we call ethereal undulations; therefore the ether is vibrating at all rapidities from those already studied to those much slower, and probably down to those rapidities that may equal those of air. We have seen that the knowledge of a vast extent of these rapidities has lately been gained, almost bridging the space. Do eyes exist sensitive to the infra-red rays? Lubbock has shown that bees, ants, etc., respond to waves of the visible spectrum in a general way, as we do, but with some notable exceptions, especially in the more refrangible parts of the spectrum. That the vast majority of the higher animals whose life struggle has been under much the same circumstances of light and shade as ourselves, possess essentially the same visual response as we do, is reasonably certain. But it may be logically supposed that such animals as have been wholly differently situated may have developed reactions to the longer waves we have found most economical to ignore. But little study of the eyes of such low orders as the *Coleoptera*, *Annelida*, etc., has been done, but that little renders it highly probable that they have a receptive mechanism for vibrations between the upper limit of aur auditory frequency and below that of our light perception. The study of the eyes of nocturnal insects, of the inhabitants of the sea at different depths, of electrical and phosphorescent animals, etc., may prove highiy instructive in this respect.

Again returning to the human eye and to our subject, we may ask what reason would there be for the extension of retinal reaction to the longer ethereal vibrations when the possibilities of color are infinitely far from being exhausted within the limits of the visible spectrum? The average visual sense commonly perceives as one and the same color, waves differing in their frequencies of arrival by such stupendous numbers as millions of millions in a second of time, as was pointed out in a previous article: Instead of straining its energies to develop response to those weak and capricious stimuli, the infra-red rays, nature were more wise to expend its energies in differentiating the possible color differences at its own door, and within the already accepted limits. Without seeking out the distant heathen, this missionary spirit could be wisely spent in the conversion of the crowds in its own neighborhood and native land. And this is precisely what nature seeks to do. The Roman mosaic workers are said to have used 30,000 different tints; 28,000 shades of wool are used at the Gobelins manufactory, and speculation has run riot in attempting to calculate the numbers of the perceptions of color-differences possible to the cultivated eye. Exercise, as we know, develops delicacy of color perception, the Quakers being deficient in this respect, whilst the trained eye can easily detect differences of hue that another cannot perceive at all. A common and superficial remark has been that the eye with its response to but one octave of the color-scale is so much poorer than the ear that reacts to many octaves of the sound-waves. The truth is that if the possibilities of hearing were multiplied a thousand or a million fold, they would not begin to rival the infinite complexity and inconceivable opulence of varied result existent and possible with the single octave of the visual stimulus. Both the human eye and the bolometer are so far from reporting the absolutely homogeneous wave-length that the distances and numbers are utterly beyond the mind's powers of appreciation. The range of hearing practically extends from wave-rapidities of about 40 to those of about 4,000 per second, and trained musicians are said to be able to detect a difference of $\frac{1}{64}$ of a semitone in the middle registers, so that the addition of a single vibration per second becomes recognizable to a highly-cultivated ear. It would therefore appear that the refinement of auditory sensibility had reached, if not its limits, at least that degree of exquisiteness reasonably desirable. But turning to ethereal vibrations we find that the eye perceives no difference in the tint of two bands of color caused by wave-systems differing in their rapidities by numbers beyond mental comprehension. The lengths of ærial undulations vary from $\frac{1}{5}$ of an inch to 33 yards; those of ethereal vibrations (visible spectrum) from .29 to .81 one hundred thousandths of a millimetre; but the delicacy of actual and possible visual sensation is proportionately multiplied with this descent into the infinitely minute, so that progressive extension and refinement of the color-sense even within the octave, stretches out illimitably. Therefore in yet another sense this divine endowment of vision that seems to be *par excellence* the intermediary between the objective world of infinitely extended matter and space, and that other world of mind as wholly infinite in its way, binds us also to a third infinity, time, in the progressive education and spiritualization of the limitless color-sense which we see is possible in Humanity's onward march. The truest and tritest of truisms is that of our utter inability to conceive what human or animal existence would have been without the sense of vision. We could not have gained the intellectual eminence of a mole or the blind-fish of the Mammoth Cave because these are products, however degenerate, of ages of vision-endowed ancestry. Even the grasshoppers of the Mammoth Cave have lost their wings. Intellect surely became possible only through and by vision; and all the objects and products of our intellectual activity are indissolubly bound up with the results and processes of ocular activity. But what finally underlies and renders possible all this sublime extension and developement of the higher life? Simply this all-penetrating, all-surrounding somewhat, that we can only adequately think of as the spirit or as the spiritualization of matter, that we can only describe by using nearly all the old terms which theology and philosophy have heretofore jealously reserved as the exclusive attributes of the deity. The ether is certainly in a strictly legitimate sense a creator of us, since man, as man, could not have developed without vision of the external universe, and vision is the common product of life and ethereal energies. The microcosm exists because the macrocosm sublimed its essences to a quivering impalpable spirit of a sufficiently high tenuity, delicacy and expansiveness, to interpenetrate and enfold all material particles, and stretch to the confines of creation. No scientist or philosopher sees the faintest hint on purely material grounds of its *raison d'etre.* Its genesis is the blankest of mysteries. It seems a somewhat, and yet utterly distinct from what we commonly call matter. It appears to be of a completely distinct and different category of being from gravitation, neither giving nor asking of it service; suns and worlds could have wheeled on their courses without it, and life of an eyeless, non-intellectual, non-spiritual and sluggish variety might perhaps have arisen where it was not. As blinded bats by means of their interdigital extension of sensitive cutaneou ssurface, avoid obstacles in flying by a fine perception of the greater barometric pressure near such objects, so man, developing without light, might be mentally pictured as at the best a sort of huge diabolic pterodactyl-like bat flapping his way through the cimmerian landscape! (The picture may stand for the edification of a stray critic or two who has kindly and vaguely hinted that we were over-interested in our ether-waves. *Sua cuique voluptas!*)

But, seriously once more, if we consider the facts that electricity and magnetism (which are its stresses) would not have been our daily aids and delights, that life on all but self-heated worlds would have been impossible without the heat-transferring agency of the ether, that all vegetation is its creation, and animal life is to us almost inconceivable without vegetation—when we think of these physical facts the rapture and adoration of sun- and light- worshipping religions and peoples becomes reasonable. These and other reasons, we think justify our studies of ethereal activity which many doubtless have thought needlessly ly long and labored. But to any one whose mind is not content to live incurious of the many mysteries among which we vulgarly swim, this superlative mystery of light and the laws of ethereal activity offers the most brilliant and absorbing, and at the same time satisfying of all fields of study. But it is when we think how the mind of man only came into being by its aid; how almost all reasoning, *i. e.*, operations of the intellect, are by means of the metaphors and pictures of light and color; and lastly how the Beautiful, that smile of God which we may also call the splendor of truth and the sign-manual of the world's divine architect and owner, is solely by means of its undulations, —it is only when we ponder upon these things that we are lost in wonder, and recognize that if anywhere in the doubtful maze of cosmic circumstance purposive and supernatural agencies become visible, it is in the creation of that subtle mystery and, for the existence of intelligent and spiritual beings, transcendently important and necessary essence, we call the ether.

ON THE OPERATIVE TREATMENT OF ENTROPIUM.

BY JOHN GREEN, M. D., ST. LOUIS.

Continued from Vol. I, Page 266.

It has fallen to the lot of the writer, in the course of twenty years of practice in St. Louis, to have to do with a very large number of cases of entropium, many of them aggravated by long neglect, or complicated by ill-devised or badly executed attempts at cure. In by far the greater number of cases the entropium has been a sequel of trachoma, which has either run its full course, with resultant cicatrization of the conjunctiva and more or less conspicuous incurvation of the tarsus, or has continued in some degree active in consequence of repeated exacerbations due to persistent or renewed irritation. Very often the incurvation of the tarsus has been complicated by persistent spasm, sometimes with apparent hypertrophy, of the orbicularis muscle, which has then played an important part in maintaining and increasing the inversion of the lid-margin. In but a single instance has a typical spasmodic entropium, with complete rolling inward of the tarsal margin, been observed in the upper eyelid; in all other cases the purely muscular type of the affection has been limited to the lower lid. So far as it has been possible to trace their beginnings, the cases of spasmodic entropium have all originated in some form of conjunctival or corneal irritation, varying in intensity and in duration from that occasioned by the lodgment of a foreign body in the conjunctival sack, or by a minute corneal phlyctenula, to the chronic irritation and blepharospasm incident to active trachoma complicated by corneal ulceration and pannus. The senile entropium of systematic writers has also been not infrequently observed, but it has been impossible to recognize in it anything more than a variety of spasmodic entropium, excited by some degree of conjunctival or corneal irritation, and favored by the abnormal laxity of tissue incident to senile emaciation.

In nearly all the cases observed, there had already been some attempt at treatment, and oftenest by frequently repeated partial or total epilation of the lid-margins. Next in frequency were cases in which a large piece of the skin, or of skin and muscle, had been excised from the upper or lower eyelid, or from both lids, with closure of the wound by sutures, often of coarse thread and deeply placed, which had not infrequently been left to cut their way out by ulceration and had given rise to permanent and sometimes highly disfiguring scars. In rarer instances, an attempt had evidently been made to supplement the excision of a portion of the lid-integument by splitting the lid-margin, as taught by Arlt, but almost always with the result of leaving a group, or even a considerable row of deviated cilia which the patients had afterwards continued to pull out for themselves or to have pulled out for them by friends. In other cases a smaller or larger number of cilia had been destroyed by some form of cautery applied to their follicles, but with the ultimate effect, in every case observed, of drawing some of the neighboring cilia out of line, to rub upon the eyeball in place of those which had been more or less perfectly destroyed. In still other cases, large and deep sutures had been inserted and tightly knotted, so as to constrict and cut through the cutaneous and muscular layers of the lid, thus giving rise to unsightly vertical bridles of cicatricial tissue, although generally without accomplishing the desired end of correcting the inversion of the lid-margin. Most distressing of all were certain cases, even now occasionally met with, in which great contraction of the palpebral fissure, together with inability perfectly to close the eyes, has followed the free abscision of the lid-margins in their entire thickness; a lamentable condition, which nevertheless was accepted in certain cases by Heister, as *miserum sed unicum auxilium*[1].

In my earlier operations on the upper eyelid, I followed, almost exclusively, the method of Arlt, as I had learned it, in 1860, in Vienna.[2] In such cases as were seriously complicated by blepharospasm, or by organic contraction of the palpebral fissure, the operation was either preceded by or combined with a free division of the outer canthus and union of the cutaneous and conjunctival margins of the cut by sutures.[1] If the trachomatous process was still active, the performance of Arlt's operation was deferred until this condition had been corrected, as far as possible, by appropriate treatment, and in cases in which the lid-margin had been previously epilated, advantage was taken of this delay to allow the cilia to grow again. If, as was not infrequently the case, a considerable portion of the lid-integument had been already sacrificed, I abstained from further mutilation in this direction, contenting myself with a free dissection between the orbicularis muscle and the front of the tarsal tissue, and holding the thoroughly loosened flap well up toward the eyebrow, by means of sutures or collodion, until it had become adherent in its new position. In the more regular Arlt-operations, a few cases of partial destruction of the marginal bridge of cilia-bearing tissue taught me to abstain from completely detaching this bridge, especially in its middle third, and, finally, to leave it connected with the eyelid, in its entire length, through the undivided orbicularis muscle, as Arlt also has latterly advised.[2] In the beginning, I followed Arlt and the ancient writers closely in excising a pretty large crescent-shaped piece of integument, but after I had proved the advantage of preserving the continuity of the marginal tissues with the standing portion of the eyelid, I ventured to make the excision along a line much nearer than before to the row of cilia, in which position I found it quite sufficient to remove only a narrow strip not exceeding two or at most three millimetres in width. In other cases I dispensed altogether with the excision of even a narrow strip of skin, and, after dissecting freely between muscle and tarsus, rolled the margin of the cilia-bearing flap forward, and at the same time held it well up towards the eyebrow, by means of three or more deep sutures entered in the marginal incision substantially as has been since advised by DeWecker[1]. v. Graefe's modification of Arlt's operation[2] was also tried, but with the result of abandoning it as offering no appreciable advantage over the original method when executed strictly in accordance with Arlt's description.

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[1] Heister—*Institutiones Chirurgicæ*, Amstelodami, 1739. Pars II, Sect. II, Cap. XLVI, III.

[2] *Vid.* Arlt—*Die Krankheiten des Auges*, Prag, 1850.

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[1] Ware—*Chirurgical Observations Relative to the Eye*, 2nd Ed., London, 1805, Vol. 1, p. 96.

[2] Graefe-Sæmisch. *Handbuch der gesammten Augenheilkunde*, III, 450.

In all these operations the most important feature of Arlt's method, namely, the splitting of the eyelid by an incision made just in front of the line of the openings of the Meibomian glands, was retained; and such changes as were made in the other parts of the procedure, were prompted by the desire to avoid the risk of ulceration or sloughing of the marginal bridge, and the mutilation incident to the excision of a large piece of skin. These desiderata were fully attained in the modified procedure, and the immediate results were as good as I have ever seen from Arlt's operation, whether as observed in his clinic or in my own practice or that of other surgeons. The final results, as observed after the lapse of a year, or even less, were, however, in the highest degree discouraging, and this not only in the cases in which I had followed Arlt most closely, but also in those in which I had adopted one or another of the modifications just mentioned.[3]

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[1] DeWecker—*Chirurgie Oculaire* Paris, 1879.

[2] *Archiv f. Ophthalmologie*, X, II, 1864.

[3] The operation of Arlt, when skilfully executed in strict accordance with the directions given by its author, yields a large proportion of cures, which, however, fall far short, so far as I have observed, of a perfect *restitutio ad integrum* of the lid-margin. In many cases, the direction of the deviated cilia is so far improved as to remove them permanently from a position of actual contact with the eyeball, but an ideal restoration of a perfect row of permanently well-directed eyelashes is, so far as I have seen, the rare exception. Besides this shortcoming, the error is very often committed of attempting to increase the effect of the operation by excising too large a portion of the lid-integument, thus giving rise to very positive disfigurement through the partial or even total effacement of the tarso-orbital fold. The perfect execution of the marginal incision, so as to include all the cilia with their bulbs in the anterior flap, is, moreover, a somewhat difficult matter, and any error in this respect involves the practical failure of the operation.

Recent modifications of Arlt's operation, in which a narrow strip of integument, attached at both ends, is transplanted from the front of the eyelid to fill the gap made by splitting the lid-margin, or in which a strip of buccal mucous membrane is transferred to the same position, are doubtless of value as opposing the tendency to secondary reproduction of the trichiasis; but they make the operation quite complicated, and leave the incurvation of the tarsus uncorrected.

Disheartened by the generally imperfect results obtained from Arlt's operation, I next tried the procedure of grooving the front of the tarsal tissue, as taught by Streatfeild,[1] and adopted, with certain additions, by Snellen.[2] The excision of the narrow wedge-shaped strip from the front of the tarsal tissue was at first found to be attended with no little difficulty, which, however, was in a great measure overcome by making use of a special knife of the form shown in Fig. 22. It not infrequently happened that the conjunctiva was cut through in some places, but this accident was found to be attended by no untoward consequences, and the results attained by the operation were, on the whole, more satisfactory than the best which I had observed in the cases in which I had followed the method of Arlt.

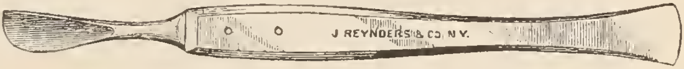

Fig. 22.

My attention was next attracted to a paper by E. Jæsche,[3] describing, with certain modifications, the operation of George Jæsche,[4] upon which Arlt had based his procedure. As described by E. Jæsche, the upper eyelid is first transfixed, from within outward, by means of a double-edged, sharp-pointed knife, one line from its free margin; the cut is then extended, in the temporal and in the nasal direction, by scissors. The entire lid-margin, bearing the cilia and their bulbs, is thus completely severed from the rest of the eyelid, excepting only at its two ends, near the outer and the inner canthus. The integument is next dissected off from the front of the eyelid, up to about two lines below the eyebrow, and the wound closed by three sutures. The needles are entered just in front of the normal cilia, and the ends of the sutures are left long, and are fastened by adhesive plaster to the forehead, so as both to raise the detached lid-margin and turn it forward.

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[1] *Ophthalmic Hospital Reports*, I, 111, April, 1858.

[2] *Compte-rendu du Congres Periodique d'Ophthalmologie*, Paris, 1862.

[3] *Klinische Monatsblaetter f. Augenheilkunde*, XI, 1873.

[4] *Medicinische Zeitung Russlands*, 1844; quoted by Arlt, in Graefe-Saemisch. *Handbuch*, III, 450.

My experience with this method was reported in a verbal communication to the American Ophthalmological Society at its 10th annual meeting,[1] July, 1874, in which I stated that I had performed the operation about fifteen times, but had modified the procedure in that I had excised only a very narrow strip of skin, and had relied mainly on deeply-placed sutures to turn the lid-margin forward and to retain it in its corrected position during the first twenty-four or forty-eight hours. The results obtained from this operation were, as a rule, most encouraging, but with the serious drawback that in two or three instances the central portion of the marginal bridge had, in some measure, lost its vitality, and thus a part of the row of cilia had been but imperfectly preserved. The resultant disfigurement was, however, much less than after the occurrence of the same accident in cases in which I had excised a broad piece of integument, as in Arlt's operation.

To obviate this danger, and, at the same time, to retain all the special advantages of Jæsche's operation, I next modified the procedure by limiting the principal incision to the conjunctiva and tarsal tissue. I was thus enabled to vary the position of the cut in different cases, placing it sometimes within a millimetre of the line of openings of the Meibomian glands, and at other times at twice or three times that distance, as the special conditions seemed to demand. In certain aggravated cases, I found it of advantage to make two parallel incisions in the conjunctiva and tarsus, the one quite near to the line of the openings of the Meibomian glands, and the other further back, at a distance of two millimetres or more from the first.[2] I was also able, without incurring the danger of ulceration or sloughing of the marginal tissues, to excise the narrow strip of skin along a line very near to the row of cilia,[3] as already mentioned in connection with Arlt's operation. In placing the sutures, generally three in number, I entered the needle in the lid-margin, either exactly in the line of the cilia or sometimes a little behind them, and, grazing the front of the tarsus, carried it upward until its point emerged through the skin, a line or two below the eyebrow. (See FIG. 23.) The sutures were then tied, but only with such degree of tension as was necessary to effect the desired eversion of the lid-margin: to insure against suppuration occurring in their tracks, they were left in place not longer than twenty-four, or, at the furthest, forty-eight hours. After the removal of the sutures, I generally applied collodion along the line of union, in order both to support the forming cicatrix and to regulate the eversion of the lid-margin.

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[1] This communication is noticed in the Transactions for 1874, but is not published, as the Society did not, at that time, print a full report of its verbal proceedings.

[2] *cf.* Aetius.

[3] *cf.* Celsus, Aetius and Paulus Aegineta.

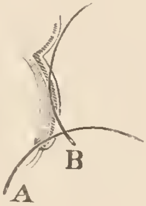

FIG. 23.

Of this improved procedure I published, in 1876, a short description,[1] in which I spoke of it as logically developed from Roser's modification[2] of v. Ammon's *tarsotomia horizontalis*[3]. Its true prototype is, however, to be sought rather in the ordinary procedure of the ancients, as described by Celsus, Aetius and Paulus Aegineta. In the description given by these writers, the essential part of the operation, as performed upon the upper eyelid, is the *ὑποτομή*,[4] a long and deep incision made in the everted lid upon its conjunctival aspect, parallel to and behind the line of the inverted cilia, and probably, as a rule, also behind the openings of the Meibomian glands.[1] The *ὑποτομή* was generally, though not always, supplemented by the excision of a crescent-shaped[1] piece of skin, bounded below by a line parallel to the row of cilia, and above by a curved line, carried up toward the eye-brow, with closure of the wound by sutures.[2]

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[1] *Transactions of the Fifth International Ophthalmological Congress*, New York, 1876.

[2] *Archiv f. physiologische Heilkunde*, XII, 1853, 511.

[3] *Zeitschrift f. die Ophthalmologie*, III, 1833, 247.

[4] Translated *subsectio* in the version of Cornaro, Lugduni, 1549.

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[1] The words of Celsus, — *in superiore palpebra sub pilis ipsis incidenda linea est, ut ab inferiore parte diducti pili sursum spectent*, — taken by themselves, may mean that this incision was intended to be made quite near to the line of the inverted cilia, and, therefore, possibly not farther back than the row of openings of the Meibomian glands. Aetius, however, writes more specifically, — *ἐκστρέψαντες τὸ βλέφαρον διδῶμεν τὴν ὑποτομὴν ἔσωθεν τῶν παρὰ φύσιν τριχῶν, ὥστε αὐτὰς πρὸς τὰς κατὰ φύσιν ἔξω νεῦσαι. ἐνίοτε δὲ κατ᾽ αὐτῶν τῶν παρὰ φύσιν τριχῶν.* And again, contrasting these two positions, — *οὐδὲν δὲ κωλύει καὶ δύο ὑποτομὰς διδόναι, μίαν μὲν ἐνδοτέρω τῶν παρὰ φύσιν τριχῶν, ἵνα ἀνάκλασις γένηται τοῦ ταρσοῦ, ἑτέραν δὲ κατ᾽ αὐτῶν τῶν παρὰ φύσιν τριχῶν·* In this description the words *κατ᾽ αὐτῶν τῶν παρὰ φύσιν τριχῶν* may be assumed to refer to a position corresponding approximately to the line of the Meibomian orifices; but, in any case, the two expressions, *ἔσωθεν τῶν παρὰ φύσιν τριχῶν* and *ἐνδοτέρω τῶν παρὰ φύσιν τριχῶν*, contrasted, as they are, with *κατ᾽ αὐτῶν τῶν παρὰ φύσιν τριχῶν*, can only be understood as implying a position considerably farther back from the lid-margin, and, therefore, necessarily at some distance behind the line of the Meibomian openings. The description of Paulus Aegineta, — *ἐκστρέψομεν τὸ ἄνω βλέφαρον, εἰ μὲν μακρὰς ἔχοι τὰς τρίχας, αὐτῶν ἐκείνων τῷ λιχανῷ καὶ μεγάλῳ δακτύλῳ τῆς ἀριστερᾶς ἐπιλαβόμενοι χειρός, εἰ δὲ πάνυ βραχείας, βελόνην ἔχουσαν ῥάμμα διὰ μέσου τοῦ ταρσοῦ ἔσωθεν ἐπὶ τὰ ἔξω διαπείραντες· εἶτα διὰ τοῦ ῥάμματος ἀνατείναντες τῇ ἀριστερᾷ τὸ βλέφαρον. τῇ δεξιᾷ τῷ πυρῆνι τῆς σμίλης ὄπισθεν τοῦ ῥάμματος αὐτὸ κολπώσαντες ἐκστρέψομεν, καὶ δώσομεν τὴν ὑποτομὴν ἐσωτέρω τῶν νυττουσῶν κατὰ τοῦ ταρσοῦ, ἀπὸ τοῦ μεγάλου κανθοῦ διήκουσαν ἄχρι τοῦ μικροῦ. τὸ δὲ ῥάμμα ὑπολαβόντες μετὰ τὴν ὑποτομὴν καὶ τῷ ἀντίχειρι τῆς ἀριστερᾶς χειρὸς ὑποβαλόντες μικρόν τι πτυγμάτιον, ἀνατείνομεν τὴν ὀφρῦν*, — taken as a whole, seems also fully to justify the view that the *ὑποτομή* must have been intended to be placed at some distance back from the lid-margin. The passing of a thread (*ῥάμμα στερεόν*, Aetius), *διὰ μέσου τοῦ ταρσοῦ ἔσωθεν ἐπὶ τὰ ἔξω διαπείραντες*, by the aid of which the eyelid is directed to be everted in cases in which the eyelashes are too short to be seized by the index finger and thumb, and the further direction to remove the thread after the *ὑποτομή* has been completed, make it nearly certain that the position of the *ὑποτομή* was intended to be behind this thread; and, inasmuch as the thread could scarcely have been placed nearer to the lid-margin than the line of the Meibomian openings, the *ὑποτομή* must needs have been behind this line.

From this ancient procedure, my own practice, in 1874-75, differed at the widest, (1) in defining the position of the under-incision—*ὑποτομή*—as behind the row of openings of the Meibomian glands, (2) in excising a very narrow strip of skin[3] instead of a broader, cresentic or myrtle-leaf-shaped piece,[4] and (3) in the manner of placing the deep sutures, which I entered in the lid-margin, in or just behind the line of implantation of the cilia, rather than in the lips of the gap in the skin,[5] or in the under-incision itself.[6] The plan of slinging up the loosened lid-margin by plastering the free ends of the sutures to the brow[7], I had already tried and abandoned.

It must not be forgotten that Celsus, comparing this operation with other plans of treatment, — namely, by destroying the bulbs of the cilia by the actual cautery, and by attempting to replace the deviated cilia, one by one, by the method of *illaqueatio — repositio ciliarum — ἀναβροχισμός*, — writes of it as the generally approved and sure method: *ea vero curatio quae palpebrae laxioris ab omnibus frequentatur, nihil habet dubii.* The clearly expressed purpose of the under-incision — *ut ab inferiore parte diducti pili sursum spectent* — is perfectly attained, and the immediately following statement — *idque, si levis inclinatio est, etiam solum satis tuetur* — is fully realized only when this incision is made somewhat behind the row of the Meibomian openings.

[1] Myrtle-leaf-shaped, *μυρσινοειδής*. — Paulus Aegineta.

[2] Hence the name *ἀναρραφή*, given by the Greek writers to the whole operation, which has seemingly given rise to the widely prevalent misconception that the ancient writers were often content with the excision of a strip of skin and the closure of the wound by sutures. As a fact, the *ἀναρραφή* proper was sometimes omitted, but never the *ὑποτομή*, in the operation on the upper eyelid.

[3] *cf.* Roser, *Archiv f. physiologische Heilkunde*, XII, 511.

[4] Aetius; Paulus Aegineta.

[5] Celsus; Aetius.

[6] Paulus Aegineta.

[7] Aetius; Paulus Aegineta.

The results obtained by the operation, as thus developed, were generally most excellent. The deep incision through the conjunctiva and tarsus gaped sufficiently to permit the cilia-bearing lid-margin to be turned well forward and fixed in its new position without undue tension on the sutures: not infrequently the conjunctiva retracted strongly when divided, so as to uncover the tarsal tissue, along the borders of the line of incision, to the width of a millimetre or even more. The under-incision healed kindly and without inflammatory complication, sometimes in the course of a few days and without the interposition of much new tissue, in other cases more slowly and with more abundant formation of new connective tissue which, however, showed little tendency to contract in width so as to reproduce the previous incurvation: even in cases of typical distichiasis, the row of abnormally directed cilia, relieved from tension on the side of the incised conjunctiva, generally fell into line with the normal cilia in the course of a few days. The previously thinned or rounded lid-margin became re-established in its original width, with a sharp and well-defined posterior angle, and with the row of openings of the Meibomian glands presenting in their normal situation. The cilia, whenever they had been spared by the previous disease, and had not been sacrificed in earlier attempts at surgical treatment, took on an improved and often very luxuriant growth, the tarso-orbital fold was well-preserved, and, with the exception of an inconspicuous and smooth cicatrix on the conjunctival aspect of the lid, there remained scarcely any trace of the very radical operation which had been performed. The effect of the under-incision in increasing the height of the tarsus upon its conjunctiva aspect was quite conspicuous, as appeared most strikingly on comparing the condition of the two upper eyelids in cases in which but one had been subjected to operation, and this not only when examined within a few weeks, but also after the lapse of two or three years.[1]

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[1] This was very strikingly shown in a case of old contraction of the tarsus, following trachoma in which the whole conjunctival sack had been deeply stained by nitrate of silver. A comparison of the two upper eyelids, a year and a half after the operation, showed, in the operated eye, an increase in the height of the tarsus equal to fully two millimetres; the line of the under-incision was marked by a band of unstained tissue, of a width of fully three millimetres, which presented a smooth and even surface scarcely to be distinguished from that of the normal tarsal conjunctiva.

During the ten years which have elapsed since the publication of my first notice of this operation in its essentially perfected form,[1] I have employed it, to the exclusion, almost, of other methods, in the treatment of entropium of the upper eye-lid,[2] and always with enhanced appreciation of its value. Such further modifications as I have learned to make in the procedure have been confined to certain details of operative technique, and to the means adopted to promote the requisite eversion of the lid-margin without needless sacrifice of any part of the lid-integument.

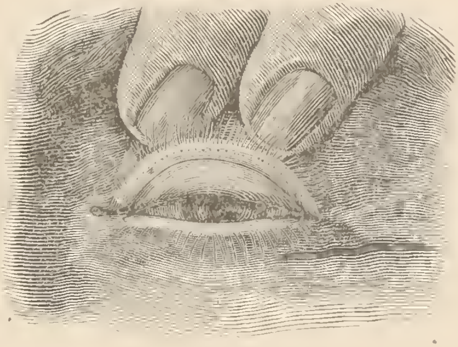

Fig. 24.

In executing the under-incision, I have dispensed with clamps of all kinds, and have found it sufficient to evert the eyelid and to hold it in position by means of the fingers, with the interposition, when necessary, of a scrap of linen or cotton rag.[3] See Fig. 24.

The cutting instrument which has been found most convenient and effective for incising the tarsal tissue, is a full-bellied scalpel of the form shown in Fig. 22. It shouldbe of hard temper, and very sharp. The under-incision should, in nearly all cases, be carried nearly or quite through the tarsal tissue, taking especial care to spare the orbicularis muscle, and it should extend, as a rule, from the temporal to the nasal extremity of the tarsus.[1]

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[1] *Transactions of the Fifth International Ophthalmological Congress*, New York, 1876.

[2] Almost the only exceptions have been in cases in which the inversion has been confined to about the temporal third of the lid-margin; in such cases, canthotomy, with union of the cutaneous and conjunctival borders of the cut by sutures, has frequently sufficed to effect an excellent cure.

[3] Aetius and Paulus Aegineta direct that a thread be passed through the eyelid to aid in its eversion in cases in which the eyelashes are wanting, an expedient which I have never had occasion to adopt.

The excision of the narrow strip of integument may be made, (1) by putting the eyelid tightly on the stretch by means of the fingers, and then marking out the limits of the portion to be excised with the knife used in making the under-incision,[2] (2) by transfixing the skin by means of v. Graefe's cataract-knife, and cutting forward, or (3) by pinching up a narrow fold of skin by

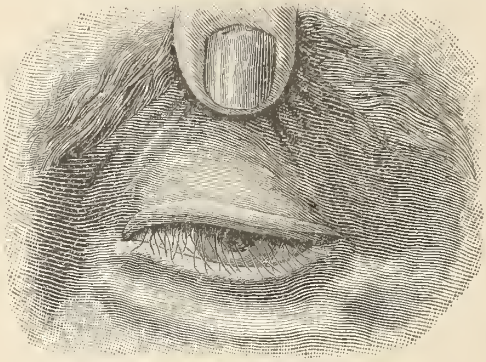

Fig. 25.

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[1] *βαθυτέρα δὲ ἔστω ἡ ὑποτομή· . . . καὶ ἀπὸ τῶν περάτων τοῦ ταρσοῦ εἰς τὰ πέρατα διδόσθω.* — Aetius.

καὶ δώσομεν τὴν ὑποτομὴν ἐσωτέρω τῶν νυττουσῶν κατὰ τοῦ ταρσοῦ, ἀπὸ τοῦ μεγάλου κανθοῦ διήκουσαν ἄχρι τοῦ μικροῦ. — Paulus Aegineta.

εἰ δὲ ἐν μέρει τινὶ μόνον τοῦ βλεφάρου ἀπὸ τῶν τριχῶν γίνοιτο νυγμός, κατ' ἐκεῖνο καὶ μόνον ποιεῖσθαι προσήκει τὴν χειρουργίαν. — Paulus Aegineta.

Whether, in any particular case, a shorter under-incision is permissible, will depend mainly upon the extent of the inverted portion of the lid-margin, as shown by the faulty direction of the openings of the Meibomian glands, and upon the completeness of the relaxation afforded by a tentative shorter incision. If the short incision is found to be in any degree inadequate it should be immediately extended, in either direction or both, until full relaxation of the parts is secured. In cases in which a preliminary canthotomy has been performed the under-incision should generally stop somewhat short of the temporal extremity of the tarsus.

[2] Celsus; Aetius; Paulus Aegineta.

the aid of appropriate forceps,[1] and cutting it off with the scalpel[2] or with scissors.[3] In any case, the excised portion should be limited strictly to the integument, leaving the superficial fascia intact. The size, shape and position of the largest piece of skin which I believe it ever to be advisable to excise are shown in Fig. 25.

If sutures are used to close the gap in the skin, and at the same time to elevate and evert the lid margin, it may be sufficient simply to unite the lips of the wound,[4] or it may be preferable to insert them more deeply, in the manner shown in Fig. 23. In the latter case, the threads should be tied quite loosely, so as moderately to evert the lid-margin but not to constrict the included tissues.

After the insertion of the sutures, in cases in which the eyelashes are sufficiently preserved, it is often of advantage to turn them upward, across the line of the closed wound, and to fix them in this position by means of collodion. The sutures may then be removed, in some cases as soon as the collodion has become thoroughly dried. in other cases preferably on the next day, or sometimes a day or two later. If the deep sutures have been used, it is not well, as a rule, to leave them *in situ* longer than twenty-four hours, lest suppuration be set up in their tracks, with possible formation of small abscesses. After the removal of the sutures, the newly-formed cicatrix should generally be supported for a few days by means of collodion, which may be strengthened, in case of need, by the admixture of a few fibres of cotton.

In a large proportion of cases, I have found it better to abstain both from the excision of any portion of skin, and from the employment of sutures in any manner. Here collodion renders most effective service, and it should be of the old fashioned contractile sort; if it has become thickened by evaporation, it should be thinned by the addition of fresh ether before using. Probably the best manner of applying it, in the greater number of cases, is by simply penciling the skin, to the width of three or four millimetres, along a line parallel to the row of cilia, renewing the application from day to day as may be necessary to maintain a proper degree of eversion. Should the contraction of the collodion in this position prove insufficient to evert the lid-margin perfectly and uniformly, the entire row of eyelashes, or such of them as remain in any degree inverted, may be turned up against the front of the eyelid and fixed there by a little more collodion. The conjoined leverage of a considerable number of eyelashes is thus effectively utilized to maintain the necessary eversion until the parts have become fixed in their new relations.

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[1] *βλεφαροκατόχῳ μυδίῳ.*— Paulus Aegineta.

[2] Ibid.

[3] Albucasis; Jesu Hali—cited from F. Adams, commentary on Paulus Aegineta, VI, VIII: Sydenham Soc'y Edition.

[4] Celsus; Aetius.

In certain cases the under-incision proves sufficient by itself,[1] so that even the pencilling of the skin with collodion may be omitted.

The effect of the under incision, when well placed and of suitable depth and length, is both to improve the curvature of the tarsus as a whole, and to relieve the previously inverted lid-margin, together with the cilia, from the abnormal traction exerted by the contracted conjunctiva and tarsal tissue. The former of these indications is often best fulfilled when the under-incision is placed several millimetres behind the line of the openings of the Meibomian glands, but, in that position, it may prove not altogether adequate to the perfect relaxation of the marginal tissues. For this reason, it is better, in certain cases of extreme incurvation, to follow the suggestion of Aetius, and to make two under-incisions, the one quite near to the lid-margin, or within a millimetre, or less, of the openings of the Meibomian glands, the other further back, at a distance of about two millimetres from the first. A serious fault of position, or insufficiency in extent or depth, of the under incision, may occasionally result in a material impairment of the result of the operation, and in such a case, we may be tempted to try to increase the primary effect by the excision of a broad strip of skin, or perhaps of skin together with the underlying muscle. The better plan, however, is to make a second under-incision, and then to pencil the skin with collodion, or to plaster the eyelashes against the front of the eyelid. This secondary under-incision may be made at any time during the progress of the primary cicatrization, or at any later period whenever the need of it shall have become apparent. It is not infrequently advisable to operate for entropium before the trachomatous process has fully run its course, in order promptly to relieve the cornea of the contact of the inverted cilia, thus possibly saving a seriously imperiled eye, and at the same time putting an end to the persistent irritation which militates strongly against the successful treatment of the trachoma. By operating thus early, we incur, however, the risk of a recurrence of some degree of entropium through further cicatricial contraction of the tarsus, and so, may ultimately have to perform a supplementary operation. In such a case, I have found that a new under-incision, conjoined with the use of collodion in one of the ways already noticed, best fulfills all the indications; it may be performed at any time after the issue of the first operation has fully declared itself.

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[1] *cf.* Celsus.

The under-incision, either by itself or conjoined with the use of collodion, affords also the best resource for supplementing the imperfect results which are often met with after other operations, such as the operation of Arlt, grooving the front of the tarsus, splitting the eyelid and abscising a marginal strip of tissue containing the cilia, excision or cauterization of the hair-follicles, etc. In such cases, after making the under-incision, I have generally abstained from excising any portion of the integument, and also from the use of sutures in any manner, and have relied mainly upon collodion to effect the required eversion of the lid-margin.

Canthotomy, conjoined as a rule with division of the external canthal ligament and union of the cutaneous and mucous borders of the cut by sutures, has been performed in many cases of aggravated blepharospasm, and generally in cases of marked contraction of the palpebral fissure. When the entropium has been limited to about the temporal third of the eyelid, the canthotomy has often proved sufficient for its complete correction, but in the greater number of cases it has been found necessary to supplement it by an under-incision, made after the full effect of the canthotomy has become manifest. In such cases the under-incision should generally begin near the nasal extremity of the tarsus, and should be extended, in the temporal direction, a few millimetres beyond the extreme limit of the still incurved portion of the lid-margin

A few special points incidental to the operation remain to be noticed.

Rather free bleeding from the under-incision has been occasionally observed, either at the time of the operation or some hours later; this has always been readily controlled by the use of iced compresses.

Granulomata not infrequently appear in the tarsal wound, and may have to be removed by scraping or by scissors.

In perhaps one-third of the cases, and chiefly when the healing of the under-incision has been somewhat protracted, the newly-formed scar-tissue has shown a tendency to contract in a longitudinal direction, giving rise to puckering of the lid-margin with more or less excessive eversion at about the middle of the tarsal border. If this is but moderate in degree, it may be neglected, as the slight disfigurement usually disappears in the course of a few months, but if the eversion is so great as materially to impair the general excellence of the result, it is better to correct it at once by making one, two or three deep incisions, through the conjunctiva and tarsus, at right angles to and crossing the line of the original under-incision. This may be done as soon as the distortion of the lid-margin has become manifest, and generally before the cicatrization of the under-incision is quite complete. These vertical incisions gape freely, and become quickly filled with new tissue; when made at the period suggested they do not materially delay the cure, and they often prove of very great utility by increasing the area and improving the configuration of the tarsus.

The operation *ἀναρραφὴ τοῦ ἄνω βλεφάρου* — *sutura palpebræ superioris*—appears to have been of gradual development. Traces of such an operation appear already in the Hippocratic writings[1], but the description is so meagre as to leave room for much conjecture as to its precise character. It would appear, however, to have been at first a sewing upward—*ἀναρραφή*—of the lid-margin, with strangulation of a bit of skin, but without the formal excision of any portion of the lid-integument. The operation was practically complete in the time of Celsus, (1st Century, A. D.), although Aetius (6th century) calls it by the name of Leonidas, who appears to have lived in the 3d century; Paulus Aegineta (7th century) writes of it as of an old and well-established method. An adequate estimate of the character of the operation is hardly to be obtained from either Celsus or Paulus Aegineta, although their descriptions fit well into that of Aetius, which is, so far as concerns the *ὑποτομή*, by far the most complete and in the main very clear. Unfortunately, the text of Aetius has never been critically edited, and but half of his extensive treatise has ever been printed[1]; the Latin versions of Montano[2] and Cornaro[3] leave much to be desired as regards accuracy. The Arabic writers on medicine, so far as their works are accessible in the Latin versions, appear to have done little more than to copy from the earlier Greek and Roman authors. Fragmentary and often very inaccurate notices of the ancient teachings are to be found scattered here and there through the systematic works on the eye, but generally as mere matters of history. The name *ἀναρραφή*, which was doubtless accurately descriptive of the Hippocratic and post-Hippocratic operation, had ceased to be appropriate even in the time of Celsus, when the suture of the integument had been supplemented by the more important under-incision—*ὑποτομή*, yet the name is retained in the latest descriptions which have come down to us in the Greek language, and minute directions are given regarding even the minor details of the *ἀναρραφή* proper, to the comparative neglect of the *ὑποτομή*.

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[1] Περὶ διαίτης ὀξέων, β′.

Both the *ἀναρραφή* and the *ὑποτομή* occur in more or less modified forms in several of the modern operations for entropium and trichiasis. In the well-known Crampton-Adams-Guthrie operation (1806, 1814, 1823), both parts of the ancient procedure are reproduced, although with alterations and additions which have gone very far to spoil it. The *tarsotomia horizontalis* of v. Ammon, (1833) and the modified *tarsotomia* of Roser (1853) combine the effect of the ἀναρραφή and the ὑποτομή, but at the cost of needless impairment of the nutrition of the severed lid-margin. The operation of G. Jæsche, both in its original form (1844) and as described by E. Jæsche (1873), is essentially the *tarsotomia* as modified by Roser. Burow, Sr., (1873) has approached nearest to the ancient procedure, in the manner of conducting the incisions, but he has directed the under-incision to be made unnecessarily deep—"*bis auf die Cutis*"—, and by following this, in most cases, by the excision of a fold of the integument he has accomplished a result which is scarcely to be distinguished from that attained by Roser and Jæsche. The celebrated operation of Arlt (1850) is so varied from its prototype in G. Jæsche's procedure as to substitute the splitting of the lid-margin, as in Flarer's operation, for the incision upon the conjunctival aspect of the upper lid.

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[1] Venetiis, 1534.

[2] Basiliae, 1535.

[3] Lugduni, 1549.

The procedure of the ancients may be briefly summed up as consisting in (1) the under-incision—ὑποτομή—, a pretty deep incision made in the previously everted upper lid, parallel to its free border, and, as I believe, behind the row of openings of the Meibomian glands, and (2) the ἀναρραφή proper, which consisted in the removal of a crescent-shaped portion of the lid-integument, with closure of the wound by sutures which were often made more effective in everting the lid-margin by plastering the ends of the threads under the eyebrow or to the fore head. The sufficiency of the ὑποτομή, in cases of moderate inversion, without having recourse to the ἀναρραφή proper, is expressly recognized by Celsus, who is correctly cited upon this point by Himly; Burow also has repeated the same observation. The single criticism to which the ancient operation has appeared to me to be open is in regard to the ἀναρραφή proper, in which the tendency of the teaching of the three authors cited would seem to be to the excision of too broad a strip of integument. The plan of inserting the sutures as indicated in Figure 23 has proved in my hands at least as efficiousness in promoting the eversion of the lid-margin as the more complicated and cumbersome expedient of plastering the ends of the threads to the forehead, but even this I have come gradually to abandon in favor of the use of collodion, as already described.

Inasmuch as a part of the literature on the subject of this operation is not easily accessible, I have thought it worth the while to bring together the three passages from the ancient authors to which I have referred in this paper. For access to the only copy of Aetius which I have been able to find in the original Greek, I desire to acknowledge my obligations to the Library of the Surgeon-General, U. S. A., at Washington. For indispensable assistance, most kindly rendered in recovering an intelligible text from the unedited Aldine edition of this author, I am 'indebted to the critical scholarship of my friend, Professor John Williams White, of Harvard University.

Ea vero curatio quae palpebrae laxioris ab omnibus frequentatur, nihil habet dubii. Siquidem oportet contecto oculo mediam palpebrae cutem, sive ea superior, sive inferior est, apprehendere digitis, ac sic levare: tum considerare quantulo detracto futurum sit, ut naturaliter se habeat. Siquidem hic quoque duo pericula circumstant: si nimium fuerit excisum, ne contegi oculus non possit; si parum, ne nihil actum sit, et frustra sectus aliquis sit. Qua deinde incidendum videbitur, per duas lineas atramento notandum est sic, ut inter oram, quae pilos continet, et propiorem ei lineam, aliquid relinquatur, quod apprehendere acus postea possit. His constitutis, scalpellus adhibendus est: et si superior palpebra est, ante; si inferior, postea propius ipsis pilis incidendum: initiumque faciendum in sinistro oculo, ab eo angulo, qui tempori; in dextro,

ab eo qui naribus propior est: idque, quod inter duas lineas est, excidendum. Deinde orae vulneris inter se simplici sutura committendae, operiendusque oculus est. Si parum palpebra descendet, laxanda sutura; si nimium, aut adstringenda, aut etiam rursus tenuis habenula ab ulteriore ora excidenda: ubi secta est, aliae suturae adjiciendae, quae supra tres esse non debent. Praeter haec in superiore palpebra sub pilis ipsis incidenda linea est, ut ab inferiore parte diducti pili sursum spectent: idque, si levis inclinatio est, etiam solum satis tuetur. Inferior palpebra eo non eget. His factis, spongia ex aqua frigida expressa superdeliganda est: postero die glutinans emplastrum injiciendum: quarto suturae tollendae, et collyrio, quod inflammationes reprimat, super inunguendum.

Nonnumquam autem, nimium sub hac curatione excisa cute, evenit, ut oculus non contegatur: idque interdum etiam alia de causa fit. Λαγωφθάλμους Graeci appellant. In quo si nimium palpebrae deest, nulla id restituere curatio potest: si exiguum, mederi licet. Paulum infra supercilium cutis incidenda est lunata figura, cornibus ejus deorsum spectantibus. Altitudo esse plagae usque ad cartilaginem debet, ipsa illa nihil laesa: nam, si ea incisa est, palpebra concidit, neque attolli postea potest. Cute igitur tantum diducta fit, ut paulum [in] ima [oculi] ora descendat; hiante scilicet super plaga; in quam linamentum conjiciendum est, quod et conjungi diductam cutem prohibeat, et in medio carunculam citet: quae ubi eum locum implevit, postea recte oculus operitur.

Celsus, *De med.*, Lib. VII., cap. vii. 8, 9, ed. Daremberg, Lipsiae, 1859.

Περὶ ἀναρραφῆς καὶ καταρραφῆς βλεφάρων, Λεωνίδους.

Πρὸς τὴν ἀναρραφὴν καθέδριον ὁ πάσχων σχηματιζέσθω πρὸς τοῖς ἀριστεροῖς μέρεσι τοῦ ἐνεργοῦντος, ταπεινότερος αὐτοῦ, πρὸς αὐγὴν λαμπράν. ἔστωσαν δὲ καὶ οἱ ὑπηρέται εὐπαίδευτοι δύο παρεστῶτες, εἷς μὲν ὄπισθεν ἀντιβαίνων, εἷς δὲ ἐκ πλαγίων. ὁ δὲ χειρίζων πρῶτον σημειούσθω κολλυρίῳ ἢ ἐγχαράξεσιν ἐπιπολαίοις τὴν αὐτάρκη τοῦ περιττεύοντος κατὰ τὸ βλέφαρον καὶ ἐρρυτιδωμένου δέρματος ἐκτομήν, ἵνα μήτε πλέον τοῦ δέοντος ἐκτμηθῇ μήτ' ἔλαττον. πλατυτέρου μὲν γὰρ ἐκτμηθέντος, λαγόφθαλμος γίγνεται ὁ πάσχων· στενοτέρου δὲ ἐκτμηθέντος, πάλιν χαλᾶται τὸ βλέφαρον, καὶ νύττουσιν ὁμοίως αἱ τρίχες. σημειούσθω δὲ καὶ ὁ κατὰ τὴν μεσότητα τοῦ βλεφάρου πρὸς τὸν ταρσὸν τόπος ἐπιπολαίῳ διαιρέσει. μετὰ δὲ τὴν σημείωσιν ἐκστρέψαντες τὸ βλέφαρον διδῶμεν[1] τὴν ὑποτομὴν ἔσωθεν τῶν παρὰ φύσιν τριχῶν, ὥστε αὐτὰς πρὸς τὰς κατὰ φύσιν ἔξω νεῦσαι. ἐνίοτε δὲ κατ' αὐτῶν τῶν παρὰ φύσιν τριχῶν, εἴγε ἐνδοτέρω ᾖ,[2] τάσσομεν τὴν ὑποτομήν, ἵνα ἡ ἐπιγιγνομένη οὐλὴ κωλύσῃ αὐτὰς πάλιν φυῆναι. οὐδὲν δὲ κωλύει καὶ δύο ὑποτομὰς διδόναι, μίαν μὲν ἐνδοτέρω τῶν παρὰ φύσιν τριχῶν, ἵνα ἀνάκλασις γένηται τοῦ ταρσοῦ, ἑτέραν δὲ κατ' αὐτῶν τῶν παρὰ φύσιν τριχῶν. . βαθυτέρα δὲ ἔστω ἡ ὑποτομή· συνεργεῖ γὰρ τῇ ἀνακλάσει καὶ τῷ κουφισμῷ τοῦ βλεφάρου· καὶ ἀπὸ τῶν περάτων τοῦ ταρσοῦ εἰς τὰ πέρατα διδόσθω. ἔπειτα πτυγμάτια μικρὰ δεδιπλωμένα τρίγωνα τῷ σχήματι τασσέσθω, ἓν μὲν παρὰ τῷ μεγάλῳ κανθῷ, καὶ ἕτερον πλησίον τοῦ μικροῦ. κατὰ δὲ τούτων τῶν πτυγματίων ὁ ἔξωθέν τε καὶ ὀπίσω ἑστῶς ὑπηρέτης ἐρειδέτω τὰς κορυφὰς τῶν μέγα δακτύλων, καὶ ὑπὸ μίαν ὁρμὴν διατεινέτω τὸ βλέφαρον, ἐρείδων τὸν δάκτυλον ὑπὸ τὴν ὀφρῦν, ἵνα ἰσότονος γένηται ἡ τοῦ βλεφάρου τάσις. σημεῖον δέ σοι ἔστω τῆς καλλίστης τάσεως τοῦ βλεφάρου, ὅταν τὸ μέσον σημεῖον φυλάξῃ τὸν ἴδιον τόπον, τουτέστι κατὰ τὴν μέσην εὑρεθῇ. μετὰ τὴν διάτασιν δέ, πρῶτον δοτέον τὴν πλαγίαν καὶ ὀβελιαίαν κάτω διαίρεσιν ἐπιπολαίαν, ἵνα μὴ τὸ ἐπιρρέον ἐκ τῆς ἄνωθεν αἷμα παρεμποδὼν γένηται τῇ χειρουργίᾳ. ἔστω δὲ ἡ τομὴ συνεγγίζουσα ταῖς βλεφαρίσιν. ἔπειτα δοτέον τὴν ἄνω μηνοειδῆ διαίρεσιν. ἀρχέσθω δὲ καὶ αὐτὴ κάτωθεν ἐκ τοῦ πρὸς τὸν μέγαν κανθὸν τόπου, καὶ ἀναφερομένη ἐπὶ τὸ σημεῖον πάλιν νεμέτω κάτω περὶ τὸν μικρὸν κανθόν. ἔστω δὲ καὶ αὐτὴ ἐπιπολαιοτέρα, ἵνα μὴ μυότρωτος γένηται ὁ πάσχων. εἶτα ἐκ πλαγίων ἑστὼς ὑπηρέτης ἀνατεινέτω τὸ βλέφαρον. ἔπειτα ἄγκιστρον καταπειρέσθω εἰς τὴν ἀρχὴν τοῦ περικεχαραγμένου τενιδίου, ἐπὶ μὲν τοῦ ἀριστεροῦ ὀφθαλμοῦ πρὸς τῷ μικρῷ κανθῷ, ἐπὶ δὲ τοῦ δεξιοῦ. πρὸς τῷ μεγάλῳ. ἀναταθέντος δὲ τοῦ ἀγκίστρου τῇ ἀριστερᾷ χειρί, ὑποδερέσθω τὸ τενίδιον τῷ ἀναρραφικῷ[1] σμιλίῳ, προσέχοντες ἵνα μὴ ἐπιπολὺ βαθυνομένης τῆς ὑποδορᾶς μυότρωτοι γένωνται καὶ ἀνίατον ἔχωσι τὸ χάλασμα τοῦ βλεφάρου. μετὰ δὲ τὴν τοῦ δέρματος ἐκτομήν, ἐπὶ τὴν ἀναρραφὴν ἐλθετέον· διδόσθω δὲ πρώτη ῥαφὴ ἡ μέση· ἔπειτα ἑκατέρωθεν ἄλλαι δύο, ὡς εἶναι τὰς πάσας ῥαφὰς πέντε. μετὰ δὲ τὴν ἀναρραφήν, ἀνατείνας τὸ βλέφαρον διὰ τὰ τραύματα, συμμέτρῳ σπληνίῳ ἐχεκόλλῳ καταλαβοῦ τὰ ῥάμματα ὑπὸ τὴν ὀφρῦν. κατὰ δὲ τῶν διαιρέσεων σπληνάρια μικρὰ κολλητικῆς καὶ ἀφλεγμάντου δυνάμεως ἐπιτιθέναι. ἔπειτα

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[1] διδόαμεν

[2] ἦ

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[1] ἀναρριφικῷ.

ἔριον ᾠοβραχὲς καθ' ὅλον τὸν ὀφθαλμόν, καὶ ἐπιδέσμει. ἐπειδὴ δὲ ἐπιτεῖνον καὶ δριμὺ καὶ ἁλμυρὸν φερόμενον ῥεῦμα ἀποβάλλει τὰς κατὰ φύσιν τρίχας καὶ σκληρὸν τὸν ταρσὸν ἀποτελεῖ, ταῖς δὲ παρὰ[1] *φύσιν ὑποπεφυκυίαις θριξὶ καὶ αὔξησιν παρέχει, δυσχερής τε ἐπὶ τούτων ἡ ἐκστροφὴ τοῦ βλεφάρου γίγνεται, προσήκει βελόνην ῥάμμα στερεὸν ἔχουσαν καταπείρειν τῷ μέσῳ τοῦ ταρσοῦ καὶ ἀνέλκειν ἐπὶ τὸ ἄνω τὸ ῥάμμα, καὶ οὕτω τῇ μήλῃ ἐκστρέφειν τὸ βλέφαρον κατὰ τὸ ἔθος· καὶ διδόναι τὴν ὑποτομὴν ὡς προείρηται.*

Περὶ *καταρραφῆς.*

Τοῦ *δὲ κάτω βλεφάρου τριχιῶντος, καταρραφὴ δοκιμάζεται. πρότερον δὲ κἀπὶ τούτων σημειούσθω ἡ*[2] *αὐτάρκης τοῦ κεχαλασμένου*[3] *περιττοῦ δέρματος ἐκτομή. κἀνταῦθα γὰρ πλατυτέρου ἐκτμηθέντος τενιδίου, ἐκτρόπιον γίγνεται, στενοτέρου δέ, ἀνωφελής ἐστιν ἡ χειρουργία. μετὰ δὲ τὴν σημείωσιν τὰ πτύγματα ὡς προείρηται κατὰ τῶν κανθῶν τασσέσθω, καὶ περιτεινέσθω το βλέφαρον. ἔπειτα πρὸς τῷ μήλῳ ἐρείδων τὸν δάκτυλον ὑπηρέτης καθελκέτω κάτω. διδόσθω δὲ πρώτη διαίρεσις ἡ μηνοειδὴς λεγομένη ἡ κάτω. ἔπειτα ἡ ὀβελιαία καὶ πλαγία λεγομένη ἡ περὶ τὸν ταρσόν. ὑποδέρειν δὲ ὡς προείρηται καὶ ῥάπτειν· καὶ τὰ ἀκόλουθα ποιεῖν. μόνη δὲ τῇ καταρραφῇ ἀρκούμεθα ἐπὶ τοῦ κάτω βλεφάρου, παραιτούμενοι τὴν ὑποτομήν, ἵνα μὴ ἐκτροπὴ τοῦ βλεφάρου γένηται.*

AETIUS, Lib. VII., cap. lxxi., lxxii., ed. Ald. Venetiis, 1534.

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[1] *κατὰ*

[2] *εἰ*

[3] *χαλασμένου*

Περὶ ἀναρραφῆς καὶ ἑτέρων τρόπων ἐπὶ τριχιώντων.

. . . .

Καθέδριον τοίνυν σχηματίσαντες τὸν κάμνοντα, ἤτοι ἐμπρὸς ἡμῶν, ἢ ἐξ εὐωνύμων, ἐκστρέψομεν τὸ ἄνω βλέφαρον, εἰ μὲν μακρὰς ἔχοι τὰς τρίχας, αὐτῶν ἐκείνων τῷ λιχανῷ καὶ μεγάλῳ δακτύλῳ τῆς ἀριστερᾶς ἐπιλαβόμενοι χειρός, εἰ δὲ πάνυ βραχείας, βελόνην ἔχουσαν ῥάμμα διὰ μέσου τοῦ ταρσοῦ ἔσωθεν ἐπὶ τὰ ἔξω διαπείραντες· εἶτα διὰ τοῦ ῥάμματος ἀνατείναντες τῇ ἀριστερᾷ τὸ βλέφαρον, τῇ δεξιᾷ τῷ πυρῆνι τῆς σμίλης ὄπισθεν τοῦ ῥάμματος αὐτὸ κολπώσαντες ἐκστρέψομεν, καὶ δώσομεν τὴν ὑποτομὴν ἐσωτέρω τῶν νυττουσῶν κατὰ τοῦ ταρσοῦ, ἀπὸ τοῦ μεγάλου κανθοῦ διήκουσαν ἄχρι τοῦ μικροῦ. τὸ δὲ ῥάμμα ὑπολαβόντες μετὰ τὴν ὑποτομὴν καὶ τῷ ἀντίχειρι τῆς ἀριστερᾶς χειρὸς ὑποβαλόντες μικρόν τι πτυγμάτιον, ἀνατείνομεν τὴν ὀφρῦν· καὶ ἕτερα δὲ μικρὰ πτυγμάτια τάξαντες ἐν ἄκροις τοῖς κανθοῖς, κελεύσομεν τῷ ὄπισθεν ἑστῶτι ὑπηρέτῃ δι᾽ αὐτῶν διατείνειν τὸ βλέφαρον· καὶ τότε δι᾽ ἀναρραφικοῦ σμιλίου δώσομεν πρῶτον τὴν ὀβελιαίαν καλουμένην διαίρεσιν, μικρόν ἀνωτέρω τῶν κατὰ φύσιν τριχῶν, ἀπὸ κανθοῦ διήκουσαν ἐπὶ κανθόν, βάθος δὲ ὡς μόνον τὸ δέρμα διαιρεθῆναι. καὶ μετ᾽ αὐτὴν τὴν μηνοειδῆ παράσχωμεν, ἀρχόμενοι μὲν ἔνθεν καὶ ἡ ὀβελιαία ἤρξατο, ἐπὶ τοσοῦτον δὲ ὕψος φερόμενοι ὡς ὅλον τὸ περιττὸν περιγραφῆναι δέρμα, καὶ τελευτῶντες ὁμοίως ἔνθα κἀκείνη· εἶτα τοῦ περιγραφέντος ἐκ τῶν δύο διαιρέσεων δέρματος μυρσινοειδοῦς τυγχάνοντος, τὴν πρὸς τῇ δεξιᾷ ἡμῶν ἀγκίστρῳ πείραντες γωνίαν, ὅλον τοῦτο τὸ δερμάτιον ἀποδείρομεν. εἶτα τοὺς μώλωπας ἀποσπογγίσαντες, τρισὶν ἢ τέσσαρσιν ῥαφαῖς τὰ χείλη τοῦ τραύματος συνάγομεν, ἀπὸ τῆς μέσης ἀρχόμενοι, καταπείραντες δὲ τὴν βελόνην ἐν αὐτῇ τῇ ὑποτομῇ· τὸ δὲ ῥάμμα ἐξ ἐρίου ἔστω. καὶ

κόψαντες τὸ περιττὸν ῥάμμα μὴ πλησίον τῶν ῥαφῶν, ἀλλ᾽ ὥστε περιττεύειν ὡς τριῶν δακτύλων αὐτοῖς μῆκος, τὰ περιττὰ διανατείναντες κατὰ τὸ μέτωπον, ἐμπλάστρῳ τινὶ τῶν ἐχεκόλλων κολλήσωμεν· τὰς δὲ τοῦ βλεφάρου τρίχας ἀκμῇ βελόνης ἀπὸ τῶν ῥαφῶν ἐλευθερώσωμεν.

Οὗτος μὲν οὖν ὁ τρόπος τῆς χειρουργίας κοινός τε καὶ ἀσφαλής. τινὲς δὲ φεύγουσι τὴν ἀποδοράν· δι᾽ ὃ μετὰ τὴν ὑποτομὴν βλεφαροκατόχῳ μυδίῳ, τοῦτ᾽ ἔστι πρὸς τὴν περιφέρειαν τοῦ βλεφάρου ἐσχηματισμένῳ ἀνατείναντες τὸ περιττὸν δέρμα, σμιλίῳ ἀποκόπτουσι, καὶ τὰς ῥαφάς, ὡς ἔφαμεν, ἐπιφέρουσιν. εἰ δὲ ἐν μέρει τινὶ μόνον τοῦ βλεφάρου ἀπὸ τῶν τριχῶν γίνοιτο νυγμός, κατ᾽ ἐκεῖνο καὶ μόνον ποιεῖσθαι προσήκει τὴν χειρουργίαν. ἔπειτα πτυγμάτια βρέξαντες ἐν ὀξυκράτῳ καὶ ἐπιθέντες ἐπιδήσομεν, ἐπιβρέχοντες αὐτῷ τῷ ὀξυκράτῳ ὑδαρεῖ ἄχρι τῆς τρίτης, καθ᾽ ἣν ἐπιλύσομεν· καὶ κόψαντες τὰ περιττὰ τῶν ῥαμμάτων περιχρίσομεν ἢ κρόκῳ ἢ γλαυκίῳ τὰ βλέφαρα, ἤ τινι τῶν ἀφλεγμάντων κολλυρίων, οἷον κροκινῷ ἢ διαρρόδῳ τινί. εἰ δὲ φλεγμαίνοιεν αἱ ῥαφαί, καὶ ἐμπλάστριόν τι τῶν ἁπαλῶν αὐταῖς ἐπιθήσομεν, καὶ ὠογάλακτι ἐγχύτῳ τὸν ὀφθαλμὸν παραμυθησόμεθα· χαυνωθείσας δὲ τὰς ῥαφὰς κόψαντες διασύρομεν.

Οἶδα δέ τινα τὴν μὲν ἀποδορὰν τοῦ βλεφάρου ποιούμενον, ὡς εἴρηται, ῥαφαῖς δὲ μὴ χρώμενον, ἀλλὰ δι᾽ ἀπουλωτικῶν φαρμάκων ἀποθεραπεύοντα. συνουλουμένου γὰρ τοῦ τραύματος, τὸ βλέφαρον κατὰ μέρος ἀνατεινόμενον τὰς τρίχας ἐκτὸς ἠνάγκαζε νεύειν. ὥσπερ οὖν ἕτερός τις οὐδὲ τῇ ἀποδορᾷ τοῦ βλεφάρου, οὐδὲ ταῖς ἐκτὸς δύο χρώμενος διαιρέσεσιν· ἀλλὰ τὴν ὑποτομὴν μόνον διδοὺς ἀνέτεινε τοῖς δακτύλοις ἢ δι᾽ ἀγκίστρου τὴν ῥυτίδα τοῦ βλεφάρου, καὶ δυσὶ καλαμίοις ἢ πεταλίοις τισίν, ἴσον ἔχουσι τοῦ βλεφάρου μῆκος, τὸ δὲ πλάτος ὅσον στενοῦ φλεβοτόμου, τὸ περιττὸν ὅλον δέρμα μέσον λαβών, διέσφιγγε δεσμῶν αὐτὰ καθ᾽ ἑκάτερα τὰ πέρατα, καὶ οὕτως ὅλον τὸ ὄπισθεν δέρμα μὴ τρεφόμενον, καὶ διὰ τοῦτο νεκρούμενον, εἴσω δεκάτης ἢ πεντεκαιδεκάτης τὸ πλεῖστον ἡμέρας σὺν τοῖς καλαμίοις ἢ πεταλίοις ἐξέπιπτεν, ὡς μήτε σχεδὸν οὐλήν τινα φαίνεσθαι.

Περὶ λαγοφθάλμων.

Λαγοφθάλμους καλοῦσι τοὺς τὸ ἄνω βλέφαρον ἀνεσπασμένον ἔχοντας. τοῦτο δὲ γίνεται τὸ πάθος ἢ φυσικῶς, ἢ ἐξ οὐλῆς τραύματος· καὶ τούτου ἢ αὐτομάτως, ἢ ὑπὸ ἀναρραφῆς, ἢ καύσεως, ὡς ἀρτίως ἐλέγομεν, ἀφυῶς γεγενημένης. ἐφ᾽ ἧς καὶ μόνον μετρία δύναται γενέσθαι διόρθωσις, πάχος ἱκανὸν ἔχοντος τοῦ βλεφάρου. - - - - - - - - - - - - - - - -

Περὶ καταρραφῆς καὶ τῆς διὰ φαρμάκου καύσεως.

Ὅσοις τῶν τριχῶν τὸ ἄνω βλέφαρον ὑποπέπτωκε πάθεσι, τοσούτοις καὶ τὸ κάτω· καὶ γὰρ μεῖζον ἑαυτοῦ γινόμενον, ἐκτρέπεται, καὶ φαλάγγωσιν ὑπομένει καὶ διστιχίαν. τῷ οὖν αὐτῷ κἀνταῦθα τῆς ἀναρραφῆς χρηστέον τρόπῳ κατὰ τὴν ἀντίστροφον τάξιν, πρῶτον διδόντα τὴν μηνοειδῆ τομὴν διὰ τὸν ἐκ τοῦ αἵματος παραποδισμόν, εἶτα τὴν ὀβελιαίαν· τὴν δὲ ὑποτομὴν παραιτητέον, ὅτι τῷ συμφύτῳ βάρει τὸ κάτω βλέφαρον ἑτοίμως ἐκτρέπεται. καὶ τὴν ἄλλην δὲ θεραπείαν ὡς ἐπ᾽. ἀναρραφῆς, πλὴν τῶν ῥαμμάτων τὰς ὑπεροχὰς ἐν τῷ μετόπῳ κολλητέον. εἰ δὲ κἀνταῦθα τὴν χειρουργίαν φεύγοντες τὴν διὰ φαρμάκου μᾶλλον αἱροῦνται καῦσιν, καὶ ταύτην ἤδη παρείληφας.

Paulus Aegineta, Lib. VI., cap. viii., x., xi., ed. Briau, Paris, 1855.

EDITORIAL.

With this number the AMERICAN JOURNAL OF OPHTHALMOLOGY completes its third volume. The editor and publisher feel that at this occasion they want to thank the medical profession as well for their pecuniary as for their literary support. The subscription list is larger than it was ever expected to become, and is continually increasing, thus giving evidence of the agreeable fact that our work is appreciated and gaining in favor. The literary support has kept pace with it, and we heartily thank our collaborators for having enabled us, more than in the former volumes, to fill our pages with the results of purely original American work.

This was our programm when we started out with what seemed to be a doubtful undertaking. The circulation of our journal both in the United States and abroad is now so large that no article published in its volumes is lost, so to speak, to the scientific world, but on the contrary, is directly brought into that class of medical men to whom any author would most desire to address his work.

The editor and publisher of this journal, in thus conveying their thanks to our patrons, again solicit most earnestly original articles on all subjects connected with ophthalmology, and hope and ask for the continuance of the work of our esteemed collaborators.

The number of the latter has grown so large that it is impossible to have all their names on our cover, much as we would like to have them appear there, since we well know that the success of our journal is largely due to them.

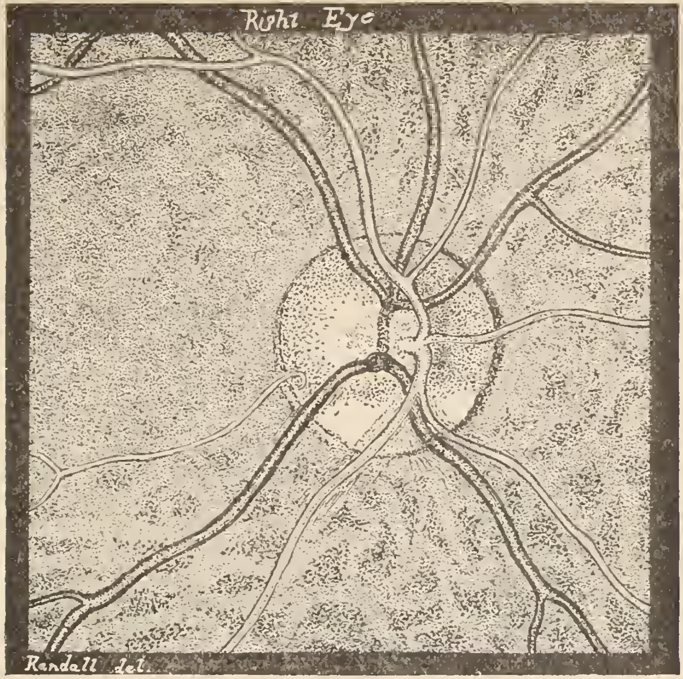
With their continued aid we doubt not but that each volume of the journal will bring more and more original American work, and that the journal will keep on improving in quality and will gain yet more in favor with the medical profession.

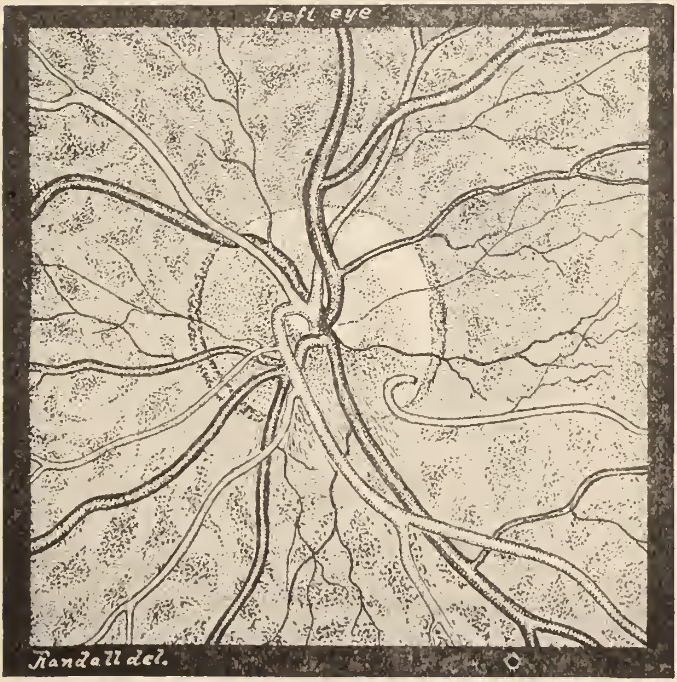
The AMERICAN JOURNAL OF OPHTHALMOLOGY for 1887 will be sent to all present subscribers without further notice. Should any subscriber wish the journal discontinued, he will please give the publisher notice to that effect.

EDITORIAL NOTICE.

The following corrections ought to be made on page 243 of our last number: Second line from below read *types* instead of *lupus.* Fourth line from below read *lupus* instead of *hysus.* Page -36, the ninth line from the top: It should be "under atropia R. $V = {}^{15}/_{xv}$ w. + .5 D."

We further draw the attention of our readers to the fact that in the review of Dr. Fox's and Mr. Gould's compend on *diseases of the eye*, etc., our statement with regard to *ulcers of the cornea* might cause a wrong idea. We did not mean to state that ulcers of the cornea had been totally omitted; what we meant to state, was that the authors had forgotten to mention them *as a cause of anterior synechia.* We also find that copper in the treatment of trachoma is mentioned, but in our opinion by far not prominently enough.





Figs. 26 and 27. These figures should have appeared with Dr. B. A. Randall's paper in the November issue of this journal.

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